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Note:—Initialed reviews written by:—

Mr. D. V. Lindley	D.V.L.

* General studies, see also individual crops.

C.A.B.
16 JUL 1956
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Plant Breeding Abstracts

Vol. XXVI, No. 3

*STATISTICS

1925 Wishart, J., Thawani, V. D., Kishen, K. & Nair, K. R.
Statistical methods.
FAO UN, Rome 1954 : FAO/55/9/6340 : InDEx/1 : Pp. 111. (Mimeographed).

The topics treated in this introduction to statistical methodology are: basic statistical theory, by J. Wishart; factorial experiments, replicated progeny-row trials and compact family block designs, by V. D. Thawani; incomplete block designs, by K. Kishen; and partially balanced incomplete block designs, by K. R. Nair.

1926 Gomes, F. P.
A comparação entre médias de tratamentos na análise da variância. **(The comparison of treatment means in the analysis of variance).**
An. Esc. Agric. Queiroz 1954 : **11** : 1–12.

Methods of testing for the significance of a difference between two treatment means devised by Scheffé and Tukey are briefly described for Portuguese readers.

1927 Yates, F.
The use of transformations and maximum likelihood in the analysis of quantal experiments involving two treatments.
Biometrika 1955 : **42** : 382–402.

A quantal experiment is one in which every observation consists in noting whether or not some effect is present. If subjects in a homogeneous group are each given one of two treatments and the quantal effect observed, then the results may be expressed in a 2 x 2 table and analysed by χ^2 in the usual way. The author considers the situation where several such experiments have been performed with possible lack of homogeneity between experiments; it is desired to test the difference between treatments and provide any estimates needed together with fiducial distributions. The method of analysis employed is to postulate that the expected proportions depend on a few parameters (for example, expressing differences likelihood equations for these parameters. The between experiments and treatments) in a definite manner and then to solve the maximum analysis is simplified if a transformation Y (P) can be found, where P is the expected proportion, such that Y is linear in the parameters, when iteration can be based on least squares techniques. Large sample simplifications are discussed.

1928 Yates, F.
A note on the application of the combination of probabilities test to a set of 2 x 2 tables.
Biometrika 1955 : **42** : 404–11.

Let χ^2 be the usual expression obtained from a 2 x 2 table without the continuity correction, and let P be the corresponding one-tail probability for this χ^2. The author shows how values of P from different experiments may be combined, and shows that the method is likely to be inefficient.

1929 Huitson, A.
A method of assigning confidence limits to linear combinations of variances.
Biometrika 1955 : **42** : 471–79.

Let s_1^2 be independent estimates of σ_1^2 distributed in the usual form. The author discusses how to determine approximate confidence limits for $\Sigma_{i=1}^{r}\lambda_1\sigma_1^2$ with known λ_1. Such problems occur in analyses of components of variance. Tables are given for $r = 2$ and λ's of the same sign. An illustrative example is included.

1930 Armsen, P.
Tables for significance tests of 2 x 2 contingency tables.
Biometrika 1955 : **42** : 494–511.

The tables are for 5% and 1% tests, both one- and two-tailed, for all 2 x 2 tables where the total number of observations does not exceed 50. An explanation of their use and a discussion of their properties are included.

1931 Cochran, W. G.
A test of a linear function of the deviations between observed and expected numbers.
J. Amer. statist. Ass. 1955 : **50** : 377–97.

Let o_1 and e_1 denote the observed and expected frequencies to which a usual χ^2 test might be applied. The χ^2 test is not directed against any particular alternative that might be suggested on *a priori* grounds or after inspection of the data. The author therefore studies tests based on $L = \Sigma w_1(o_1 - e_1)$ where w_1 are known numbers. Numerous examples are given, and the effect of selecting the w_1 after inspection of the data is discussed. (Cf. Abst. 1936).

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* General studies, see also individual crops.

1932 JACKSON, E. J. & ROSS, E. L.
Extended tables for use with the "G" test for means.
J. Amer. statist. Ass. 1955 : **50** : 416–33.

A G test is an analogue of Student's t test with the range replacing the standard deviation. Percentage points are given for 10%, 5% and 1% significance levels and sample sizes up to 15.

1933 FIX, E. & HODGES, J. L. (JUN.)
Significance probabilities of the Wilcoxon test.
Ann. math. Statist. 1955 : **26** : 301–12.

Tables are given which enable tests of significance for the Wilcoxon two-sample test to be carried out, when the smaller sample size does not exceed 12. Approximations are given for larger samples.

1934 HODGES, J. L. (JUN.)
A bivariate sign test.
Ann. math. Statist. 1955 : **26** : 523–27.

Two pairs of readings are taken on each of n subjects, one pair before, one pair after treatment. A simple test, generalizing the usual sign test when only one observation is made before and after treatment, is proposed, and a table given which enables significance levels to be found in many practical situations.

1935 MCINTYRE, G. A.
Design and analysis of two phase experiments.
Biometrics 1955 : **11** : 324–34.

A two-phase experiment is one in which each experimental unit of the first phase (such as a cell in a Latin square) undergoes replicated analyses according to a further design in the second phase. In the simplest case the analyses of the second phase are pure replications but in more complicated cases necessary replication may introduce additional effects. There is a brief general discussion at the beginning of the paper, but the greater part of it is devoted to a particular experiment on the effect of light treatment on the synthesis of tobacco mosaic virus. In the first phase the units are leaves of the test plants; the assay of these leaves in the second phase involves replications on different assay plants. The effects of both plants and leaf positions have to be eliminated. The complex analysis of the Graeco-Latin squares is described in detail, together with the numerical results.

1936 ARMITAGE, P.
Tests for linear trends in proportions and frequencies.
Biometrics 1955 : **11** : 375–86.

The analysis of a contingency table of 2 rows and n columns by the usual χ^2 technique does not take into account any natural order that may exist amongst the n groups. The question usually asked is not whether the proportions in the n groups differ significantly, but whether they show a significant trend with group order. The present paper discusses the tests which have been proposed to deal with the narrower problem, based either on scores attached to the groups or on rank correlations (cf. Abst. 1931).

1937 RAUTERBERG, E.
Bemerkungen zu der Arbeit des Verfassers "Die Berechnung der Streuung von Versuchsergebnissen". **(Remarks on the author's work: "the estimation of the deviation of experimental results").**
Z. PflErnähr. Düng. Bodenk. 1956 : **72** : 220–24.

In reply to some criticisms of W. Schreiner, the author amplifies his method for estimating σ (cf. *PBA*,* Vol. XXV, Abst. 11).

1938 CHANG, L.-C.
(Theory and practice of the analysis of variance of a two-way classification involving unequal subsamples).
Chunghua Nunghsueh Hui Pao/J. agric. Ass. China 1955 : No. 9 : 30–49. [Chinese].

Formulae are worked out for estimating the coefficients of the component variances of the mean squares in two-way classifications involving disproportionate numbers in the subsamples.

1939 PIRES, A. J. C. & BAPTISTA, J. G.
Análise do delineamento em blocos casualizados quando existem dois e três talhões perdidos. **(Analysis of the randomized-block layout when two or three plots are missing).**
Melhoramento 1955 : **8** : 61–77.

The technique of estimating the yield and variances for comparisons between treatment means of 2–3 missing plots is described.

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* *Plant Breeding Abstracts.*

1940 Atanasiu, N.
Statistische Auswertung von Versuchsergebnissen. (**Statistical evaluation of experimental results**).
Z. landw. Vers.- UntersuchWes. 1955 : **1** : 88–94.

A short general account is given of the author's views on the application of statistics to experimental results, in particular field trials (cf. *PBA*, XXIV, Abst. 3 and XXV, Absts. 21 and 638).

1941 Müller, K.-H.
Zum Bodenausgleich bei der Blockanlage des Feldversuches. (**On compensating for soil differences in the randomized-block layout in field trials**).
Z. landw. Vers.- UntersuchWes. 1955 : **1** : 233–41.

A method of allowing for soil variation between columns in a randomized-block layout in which the blocks are arranged one above the other is described.

1942 Salati, E.
Experimentação agrícola. (**Agricultural experimentation**).
An. I Congr. brasil. Estud. Agron. 1955 : 71–80.

An elementary exposition of statistical principles used in field trials is given.

1943 Horváth, A.
Az eltérés elemzés. (**The analysis of difference**).
Növénytermelés 1954 : **3** : 103–14.

Analysis of variance of field trials is criticized on the ground that too much information, such as the signs of the differences, is lost on immediate squaring. An alternative technique in which, for each variety, the varietal differences for each plot are subtracted successively from the block and column differences before squaring and summation, is described.

1944 Gomes, F. P.
As geometrias finitas e sua aplicação nos delineamentos experimentais. (**Finite geometries and their application in experimental designs**).
An. I Congr. brasil. Estud. Agron. 1955 : 123–26.

An introductory account of the ways in which finite geometries can be used in designing experimental layouts is given.

1945 Sahasrabudhe, V. B.
Block efficiency and number of replications for progeny row trials of cotton.
Indian Cott. Gr. Rev. 1955 : **9** : 106–11.

Block efficiency and the number of replications required for a particular degree of accuracy in progeny-row trials of cotton were calculated from a uniformity trial of the variety Dhar 43 laid down at the Institute of Plant Industry, Indore. With less than 120 progenies, the arrangement of the progeny rows in compact blocks enhances the accuracy of the comparisons; with more than 120 progenies, block efficiency is low (1·00–1·16). With the amount of seed per parent normally available, it is not possible to grow more than 3–6 replicates, which, with the usual plot sizes of 6′ x 2′ or 12′ x 2′, results in a minimum standard error of 10·5%.

1946 Pearce, S. C.
Experimentation with perennial plants.
FAO UN, Rome 1954 : FAO/55/8/5513 : InDEx/3 : Pp. 51. (Mimeographed).

Statistical methods specially adapted to experiments with perennial plants are described. Among the topics treated are analysis of successive crops from the same trial, layouts, covariance analysis, treatment of missing plots, scale transformations and factorial designs.

*GENETICS

1947 Laughnan, J. R.
The career of Lewis John Stadler.
Res. Bull. Mo. agric. Exp. Sta. 1955 : No. 588 : 5–6.

Bent, H. E.
Dr. Stadler's contribution to University of Missouri.
Ibid. 1955 : No. 588 : 7–9.

Beadle, G. W.
Gene structure and gene function. A lecture dedicated to Dr. Stadler.
Ibid. 1955 : No. 588 : 10–38.

Stadler, L. J.
The gene.
Ibid. 1955 : No. 588 : 39–67.

In this bulletin published in commemoration of L. J. Stadler, J. R. Laughnan contributes a foreword outlining the career of this geneticist and H. E. Bent an account of his contribution to the activities of the University of Missouri. G. W. Beadle presents a comprehensive survey of investigations throwing light on the nature of the gene. Stadler's paper on The gene is reprinted from *Science* (cf. *PBA*, XXV, Abst. 1542).

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* General studies, see also individual crops.

1948 Hollander, W. F.
Epistasis and hypostasis.
J. Hered. 1955 : **46** : 222–25.

A discourse on the semantic history of the above two terms is presented.

1949 Allard, R. W.
Formulas and tables to facilitate the calculation of recombination values in heredity.
Hilgardia 1956 : **24** : 235–78.

Maximum-likelihood equations for estimating recombination values from numerous types of F_2 and F_3 data are tabulated. Tables of scores to facilitate the numerical solution of these equations are also provided, together with tables to assist in the computation of the standard error of the recombination values.

1950 Payne, L. C.
The theory of genetical recombination: a general formulation for a certain class of intercept length distributions appropriate to the discussion of multiple linkage.
Proc. roy. Soc. 1956 : Ser. B : **144** : No. 917 : 528–44.

A mathematical consideration of the $(1/2m)\chi^2_{2m}$ distribution for intercept length introduced by Owen to assist in the computation of map distances is presented (cf. *PBA*, XIX, Abst. 2289). It is shown that for $m = 3$, lower Kosambi coefficients than appear to occur are predicted. The choice of $m = 2$, made by Owen, seems therefore to be justified.

1951 Pritchard, R. H.
The linear arrangement of a series of alleles of *Aspergillus nidulans*.
Heredity 1955 : **9** : 343–71.

Of nine physiologically allelic adenine-requiring mutants (*ad*) of *A. nidulans*, four were mutants at different but very closely linked loci separable by crossing over and three others were mutants at loci different from two of the first four but of undetermined position with respect to the other two and to each other. Evidence was obtained that physiologically allelic mutants are not usually the result of reoccurrence of mutation at the same locus. Analysis of meiotic recombination suggested that a cross-over between two *ad* alleles, and perhaps between any very closely linked mutants, is associated with negative interference, i.e. with a more frequent occurrence of one or more further exchanges nearby than can be accounted for by chance; corroborative evidence was provided by analysis of half-tetrads following mitotic crossing-over. There is evidence that negative interference of this type occurs in other organisms. It is pointed out that single cross-overs detected cytologically or genetically may be the net result of clusters of exchanges so close together as to be detectable only under special conditions.

1952 Winge, Ø.
On interallelic crossing over.
Heredity 1955 : **9** : 373–84.

It is suggested that the extremely closely linked loci R_1r_1 and M_1m_1 in *Saccharomyces* governing the ability to ferment raffinose and maltose, respectively (cf. *PBA*, XXII, Abst. 2520), may be regarded as a single complex gene pair $M_1^{R_1}$ $m_1^{r_1}$ or $M_1^{r_1}$ $m_1^{R_1}$, within which interallelic crossing over, i.e. exchange of molecular groups, may take place; thus from the heterozygote $M_1^{r_1}$ $m_1^{R_1}$ the two new types $M_1^{R_1}$ and $m_1^{r_1}$ may arise. The close linkage between M_3m_3 and R_3r_3 may be explained in a similar manner (cf. *PBA*, XXIV, Abst. 884). It is assumed that the enzymes produced through the activity of the genes in question are chemically very similar, differing only in a portion of the whole enzyme molecule. Two types of interallelic crossing over are distinguished: (1) axial, in which the chromatid axis takes part in the process; and (2) nonaxial, in which only a side chain belonging to the complex gene molecule is exchanged with another. The latter type is thought to obtain in the above examples and the former in the A^b gene in maize (cf. *PBA*, XXIII, Abst. 298).

1953 Lamprecht, H.
Die Berechnung des Crossingoverwertes mit mittlerem Fehler bei Kombination von in Koppelungs- und Repulsionsphase erhaltenen Kreuzungsergebnissen. (**The calculation of the cross-over value with mean error by combining the results obtained by crossing in the coupling and repulsion phases**).
Agri hort. genet., Landskrona 1955 : **13** : 194–97.

The formula

$$CrO_{K+R} = CrO_K +/- \frac{|CrO_K - CrO_R| m_K}{m_K + m_R}$$

is proposed for the computation of mean cross-over value (CrO_{K+R}); CrO_K is the cross-over value in the coupling phase, CrO_R is the corresponding value in the repulsion phase, m_K is the mean error of CrO_K, and m_R is the corresponding value for CrO_R. An expression is also derived for the mean error of the mean cross-over value. Examples of the application of the formulae are given for some linkage data on peas.

1954 Mahbub Ali & Hadley, H. H.
Theoretical proportion of heterozygosity in populations with various proportions of self- and cross-fertilization.
Agron. J. 1955 : **47** : 589–90.

It is shown that the proportion of heterozygosity (H) occurring in the nth filial generation may be expressed by the formula

$$H = 2pq \left[\frac{a\,(1 - r^n}{1 - r} \right] + hr^n$$

where p and q are the frequencies with which the genes B and b respectively would occur under random crossing, r is $\frac{1}{2}$ the proportion of self fertilization, a the proportion of cross fertilization and h the initial proportion of heterozygosity. It is assumed that no selection takes place.

1955 Malinowski, E.
Hybrid vigour in *Phaseolus* and *Petunia*.
Bull. Acad. polon. Sci. 1955 : Cl. II : **3** : 181–88.

The heterotic effects evinced by F_1 generations of crosses between inbred lines of cross-pollinated varieties of *Petunia* on the one hand and of the self-pollinated species *Ph. vulgaris* on the other were compared. Hybrid vigour in respect of plant height, number and length of internodes, size and number of leaves, fruit size and disease resistance was observed in both cases. Time of flowering was usually intermediate between those of the parent varieties but the period of flowering was considerably longer in the hybrids. On the basis of the above findings the author concludes that heterosis may be as pronounced in self-pollinated species as in cross-pollinated species.

1956 Lindegren, C. C.
Is the gene a prime mover?
Nature, Lond. 1955 : **176** : 1244–45.

The author suggests that the gene may not be a primary component of living matter but a more recently developed agent of functional control. He further suggests that genes may not be composed of deoxyribonucleic acid (DNA) but of "plastic" materials attached to the DNA of the chromosomes, this DNA serving not only a structural purpose but also as an intermediary in the functional organization of the cell.

1957 Kühn, A.
Versuche zur Entwicklung eines Modells der Genwirkungen. **(Attempts to develop a model of gene actions).**
Naturwissenschaften 1956 : **43** : 26–28.

The author discusses the chemistry of gene interaction with reference to the inheritance of eye colour in *Ephestia* and *Drosophila*. It is demonstrated that, by direct injection or forced feeding on certain chemical substances, it is often possible to counteract the effects of a given mutation or to produce the same effects as are obtained by a mutation.

1958 Kimura, M.
Random genetic drift in multi-allelic locus.
Evolution, NY 1955 : **9** : 419–35.

The complete solution for random genetic drift involving only one pair of alleles, derived by the author in an earlier paper, is recapitulated (cf. Abst. 838). In the present paper, asymptotic solutions are given for triallelic and m-allelic loci. It is noted that as m increases, the probability of coexistence of all the alleles drops rapidly.

1959 Kempthorne, O.
On the covariances between relatives under selfing with general epistacy.
Proc. roy. Soc. 1956 : Ser. B : **145** : No. 918 : 100–08.

The convariance of the rth generation and sth generation progeny means of individuals in an original diploid population propagated by selfing for the general case of arbitrary numbers of loci and alleles and arbitrary epistasy, is given by

$$\sigma_{yy} + \sum_{m=1}^{n} \left(K_r^m + K_s^m\right) (-1)^m \sigma_{ym} + \sum_{l,m=1}^{n} K_r^l K_s^m (-1)^{l+m} \sigma_{lm},$$

where $K_r = 2\,(1 - 1/2^r)$.

1960 Haldane, J. B. S.
The conflict between inbreeding and selection. I. Self-fertilization.
J. Genet. 1956 : **54** : 56–63.

The frequency of heterozygotes in an inbred population where the heterozygotes are at a selective advantage is considered. It is shown that the frequency of heterozygotes at equilibrium depends on the selective conditions.

Various of the formulae obtained by Hayman and Mather in their analysis of this problem (cf. *PBA*, XXIV, Abst. 26) are believed to have been vitiated by the improper use of matrix algebra.

1961 Haldane, J. B. S.
The measurement of variation.
Evolution, NY 1955 : **9** : p. 484.

The commonly used formula for the coefficient of variation,

$$\frac{n \Sigma x_r^2 - (\Sigma x_r)^2}{n^2},$$

is biased. Most of the bias is removed by multiplying by $\left(1 + \frac{1}{4n}\right)$.

1962 Kappert, H.
Einige für Evolutionsfragen interessante Mutationen bei *Matthiola*. (**Some mutations of *Matthiola* of interest for evolutionary questions**).
Ber. dtsch. bot. Ges. 1955 : **68** : 413–22.

Four mutations affecting the floral construction of *M. incana* are described. Three were induced by X irradiation and the fourth, designated mut. *anantha*, was a spontaneous mutation. All four mutations were determined by single recessive genes and the mutants were characterized by aberrant petals and changes in the construction of the stamens and in the number of anthers per flower. Of particular interest is mut. *anantha*, some of the foliage leaves of which had rudimentary ovules along the sides and the midrib. It is suggested that this mutant provides an indication of a way in which the mutation of a single gene may result in the formation of a new species or genus.

1963 Gluscsenko [Gluščenko], I. E.
A micsurini tanítás alapelvei. (**The fundaments of Mičurin's teaching**).
Agrártudomány 1955 : **7** : 76–79.

A general account of Mičurinism for Hungarian readers is presented.

1964 Havass, G.
Adatok és eredmények fajok más fajjá alakulásáról. (**Data and results on the formation of species from other species**).
Magyar tud. Akad. Biol. agrártud. Oszt. agrártud. Aloszt. Közl. 1952 : **3** : 171–81.

Reports of interspecific conversions believed to have occurred in Hungary between *Poa pratensis* and *P. trivialis*, *Aegilops cylindrica* and *Ae. triunciata* and between various *Triticum* and other species are given.

1965 Feĭginson, N. I.
(**Mičurinist theory, the basis for plant production**).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1955 : **16** : 358–67. [Russian].

The basis of Mičurinist genetics is outlined and experiments involving the use of Lysenko methods are mentioned. They include the writer's own research on potatoes and beans at Moscow. Hybrids between *Solanum tuberosum* and *S. leptostigma* were trained for high starch content by raising the F_1 on soil dressed with sucrose and glucose. The second, third and fourth tuber generations of these plants were high in starch; normally the high starch content of *S. leptostigma* is imparted only to the F_1 tuber generation of its hybrids.

The unwanted character of greenish-yellow seed colour in the *Phaseolus* variety Triumf [Triumph] has been changed to white by grafting this variety twice on to a white-seeded bean variety from the Novozybkov district.

1966 Hruščov, G. K. (Editor).
(**Mičurinist theory and modern biology**).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1955 : **40** : 129–35. [Russian].

An appreciative review of Mičurinist concepts of evolution and genetics is given.

1967 Lysenko, T. D. & Nesmejanov, A. N.
(**100 years since the birth of I. V. Mičurin**).
Vestn. Akad. Nauk. SSSR (Rec. Acad. Sci. USSR) 1955 : No. 11 : 3–19. [Russian].

Soviet government representatives, foreign delegates and scientists from many parts of the USSR were present at a meeting, commemorating Mičurin, held in Moscow on 27 October 1955. A preamble was read by Nesmejanov and a report by Lysenko, the latter dealing briefly with the principal tenets of Mičurinism. The following points were made in Lysenko's statement:

(1) The use of irradiation and toxic substances as a means of inducing mutations is accepted. These are said to shatter the inheritance of an organism. A new form then arises when the organism is subjected to altered external conditions. (2) Heterosis in maize and other plants may be produced by crossing selfed lines; work

on the production of inbreds is regarded as important. (3) A thesis is put forward that the segregating progeny of an interspecific hybrid comprises new forms or varieties of the parent species and never replicates the typical parent species. (4) The problem of "the biological species" is referred to as the most acute in modern biology and further research is urged.

1968 Lysenko, T. D.
(**One hundred years since the birth of I. V. Mičurin**).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1955 : No. 6 : 3–14; and Agrobiologija (Agrobiology) 1955 : No. 6 : 3–14. [Russian].

An extended account of the report summarized in Abst. 1967 is given.

1969 Dvorjankin, F. A.
(**Mičurinist agronomic biology**).
Zemledelie (Agriculture) 1955 : No. 10 : 8–14. [Russian].

Mičurin is said to have initiated the revision of Darwinism upon Marxist principles and to have proved the inheritance of acquired characters in plants by his breeding experiments.

1970 Crosby, J. L.
A suggestion concerning the possible role of plasmagenes in the inheritance of acquired adaptations.
J. Genet. 1956 : **54** : 1–8.

"The view is put forward that acquired adaptation of a very general nature could be inherited by a system in which, when the growth rate of an organism is retarded by environmental conditions, the rate of reproduction of plasmagenes affecting that growth rate is retarded to a lesser degree or not at all. The consequent increased concentration of these plasmagenes is supposed to tend to restore the original growth rate (the organism thus becomes adapted to the new conditions). This leads to a new, higher, equilibrium concentration of the plasmagenes, and it is further supposed that this is passed on in reproduction to the next generation, which in this way inherits the adaptation.

"It is further argued that rate of plasmagene reproduction is subject to control by nuclear genes, and that systems such as that suggested could have come into being by the ordinary processes of natural selection of nuclear genes.

"Inheritance of acquired adaptations must be looked for in general characters of growth and vigour, and not in specific characters such as those of morphology or behaviour."

[Author's summary].

1971 Sakai, K.
(**Theoretical studies on the technique of plant breeding. II. The theory of detecting optimum combinations in breeding autogamous plants by means of hybridization**).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 110–14. [Japanese].

In the present article of this series (cf. *PBA*, XXV, Abst. 2642), the author presents the mathematical theory for selecting superior segregates in a bulk population in which the character being selected is subject to additive and nonadditive gene interaction, environmental influence and additive and nonadditive intergenotypic competition. The treatment is along the lines devised by Mather (cf. *PBA*, XIX, p. 913).

EVOLUTION

1972 Cîteva concluzii la discutia asupra problemei speciei şi formării speciei şi despre sarcinile viitoare în această problemă. (**Some conclusions in the discussion on the problems of species and the formation of species and the future of this problem**).
An. Romîno-Soviet. 1955 : **9** : Ser. Biol. : 122–46.

The original Russian version of this article was summarized in *PBA*, XXV, Abst. 44.

1973 Nesterov, V. G.
(**The origin of species and intraspecific relations in plants**).
Izv. Timirjazev. seljskohozjaĭstv. Akad. 1955 : No. 1 : 25–52. [Russian].

A new Marxist theory of intraspecific competition which rejects Darwin's so-called Malthusian errors is presented. Intraspecific relations in plants are said to be extremely varied and to include antagonism and mutual help; intraspecific competition is not regarded as a primary evolutionary force. It is therefore contended that the conflicting Soviet schools of thought on evolution, the one headed by Lysenko and the other by Sukačev, oversimplify the problems. Even so Lysenko's dicta on interspecific and intraspecific relations are broadly accepted. In this connexion Sukačev and other botanists are criticized for giving descriptions of new species of forest trees based solely on quantitative morphological characteristics. Sukačev's ecological research, which is referred to as "scholastic and Neo-Darwinist," is also criticized.

1974 Kaganov, V. M.
(Some philosophical and theoretical problems concerning Mičurinist theory).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1955 : **16** : 321–32. [Russian].

Various evolutionary theories and the concept of evolutionary leaps are discussed from the Marxist viewpoint. Lysenko's theory of evolution by interspecific conversion is regarded as an important materialist achievement, as it is thought to be based on the principles of Darwin, Mičurin and Williams and to accord with materialist principles of the unity between continuous and interrupted development. Recent opponents of Lysenko in the USSR are criticized.

1975 Prezent, I. I. & Halifman, I. A.
(Some questions concerning the theory of the biological species and the origin of species).
Agrobiologija (Agrobiology) 1955 : No. 6 : 15–30. [Russian].

Darwin's evolutionary theory is criticized for its so-called Malthusian errors and for not accounting for evolutionary leaps. The theories of heterogenesis and mutation by leap of such writers as Köllicker and Koržinskii are also rejected on the grounds that they are based on chance and disregard the evolutionary force of external conditions. Lysenko's concept of evolution (cf. *PBA*, XXI, Abst. 2500) is accepted without qualifications and published reports on conversions (cf. *PBA*, XXI, Abst. 1738 and XXIV, Absts. 1861, 1894 and 2889) are cited as supporting evidence. The concept of species of the nineteenth-century French scientist Tremaux which is held to conform essentially with Lysenko's ideas is expounded.

1976 Straw, R. M.
Hybridization, homogamy, and sympatric speciation.
Evolution, NY 1955 : **9** : 441–44.

Study of hybridization and introgression among four *Pentstemon* spp. in California has suggested that sympatric speciation as the result of homogamic selective pollination of the variant flowers of a hybrid type by an insect whose visits become confined to this type may be a less unlikely mode of speciation than has been hitherto supposed.

*CYTOLOGY

1977 Moses, M. J. & Taylor, J. H.
Deoxypentose nucleic acid synthesis during microsporogenesis in *Tradescantia*.
Exp. Cell. Res. 1955 : **9** : 474–88.

As shown by means of the autoradiographic technique and cytophotometric measurements of the Feulgen reaction, three periods of P^{32} incorporation in deoxypentose nucleic acid (DNA), viz. early prophase of meiosis I, late interphase of microspore division and mid-interphase of pollen division, corresponded with periods of increasing DNA content. Comparison of the authors' observations with data published on X-ray-induced breakage suggests that completion of DNA synthesis occurs at about the time the chromosomes first behave as double entities in their response to irradiation.

1978 Mazia, D. & Plaut, W. S.
The distribution of parental material in chromosome reproduction.
Biol. Bull., Wood's Hole 1955 : **109** : 335–36. (Abst.).

Determination of the distribution of labelled deoxyribosenucleic acid in the mitotic chromosomes of *Crepis capillaris* indicated that the parental chromosome material is not equally distributed among the daughter chromosomes.

1979 Sharma, A. K. & Sharma, A.
Fixity in chromosome number of plants.
Nature, Lond. 1956 : **177** : 335–36.

Investigations on members of the Aroideae, Liliaceae, Amaryllidaceae and Dioscoreaceae with obligate vegetative multiplication have revealed inconstancy with respect to chromosome number and caryotype within a given species. It is suggested that such variations may lead to speciation.

1980 Schmidt, F. O.
Chromosomes, genes and macromolecular systems.
Nature, Lond. 1956 : **177** : 503–05.

It is suggested that the banded structure of the chromosome may be the result of a specific mode of aggregation of a limited number of deoxyribonucleic acid and protein species, and that such aggregation may occur spontaneously in the appropriate chemical environment. It would not be necessary, in this view, for chromosome replication to be envisaged as a unitary process; it would have to be supposed, however, that the cell is capable of maintaining a highly characteristic chemical environment. The genetical implications of these views are discussed.

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* General studies, see also individual crops.

1981 Smith, B. W.
Sex chromosomes and natural polyploidy in dioecious *Rumex*.
J. Hered. 1955 : **46** : 226–32.

A description is given of meiosis in the diecious species *R. hastatulus* (cf. *PBA*, XVII, Abst. 1082), which has three pairs of autosomes and the sex chromosomes XX (♀) or XY_1Y_2 (♂). It is suggested that *R. acetosa* and related diecious species with six autosome pairs and the XX or XY_1Y_2 sex chromosomes may have arisen from a form resembling *R. hastatulus* by chromosome doubling followed by the loss of one set of sex chromosomes.

1982 Hyde, B. B.
The effect of Versene on the structure of plant chromosomes.
Biol. Bull., Wood's Hole 1955 : **109** : p. 347. (Abst.).

Treatment of root tips of onion and *Vicia faba* with 0·01 M Versene (disodium salt of ethylenediamino-tetracetic acid) caused marked swelling of metaphase and late-prophase chromosomes and their subsequent dispersion, the chromatin being separated into smaller units. Root tips treated with $CaCl_2$ and Versene continued to divide normally but treatment with $MgCl_2$ and Versene resulted in swelling and dispersion. Ca is therefore the critical ion chelated by Versene.

1983 Schwanitz, F.
Die stoffliche Grundlage der Vererbungserscheinungen. (**The material basis of inheritance phenomena**).
Umschau 1955 : **55** : 136–39.

Work on the structure of DNA and its method of multiplication is surveyed, particular reference being made to the model of Watson and Crick (cf. *PBA*, XXIV, Abst. 58) and Wilkins, Seeds, Stokes and Wilson (cf. *PBA*, XXIV, Abst. 809).

1984 Bloch, D. P.
A possible mechanism for the replication of the helical structure of desoxyribonucleic acid.
Proc. nat. Acad. Sci. USA 1955 : **41** : 1058–64.

The proposed mechanism is as follows. The hydrogen bonds connecting the bases of the two helices rupture. The bases then rotate *ca.* 180° about the bond connecting them with the pentose ring and combine by hydrogen bonding with complementary bases of unpolymerized nucleotides. After the unpolymerized nucleotides are aligned, the hydrogen bonds connecting them with the original helices rupture, the hydrogen bonds of the original helices become reestablished, and corresponding hydrogen bonds connect up the replicate nucleotides into a new twin helix. The nucleotides of the original helix are believed to be maintained in position after the initial rupture of the hydrogen bonds by the helical histone sheath. This mechanism supposes that both strands of one daughter helix are original and both strands of the other daughter helix are new.

1985 Gluscsenko [Gluščenko], I. E.
A növényi sejtek és sejtmagok szaporodásának néhány kérdése. (**Some problems concerning the reproduction of plant cells and nuclei**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1955 : **6** : 1–24.

The original reports on which this paper is based were summarized in *PBA*, XXII, Abst. 1619 and XXIII, Abst. 1650.

1986 Shimoya, C.
Algumas observações sôbre as células do tapête dos estames. (**Some observations on the tapetal cells of the stamens**).
Ceres, Minas Gerais 1955 : **9** : 293–303.

Tapetal cells were found to have 2, 3 or 4 nuclei in *Lycopersicon esculentum* and certain other species examined. A close relationship was observed between the nuclear development of the tapetal cells and the pollen mother cells and in *Araucaria angustifolia* and other species fusion was observed between the two.

1987 Wilson, G. B. & Hyypio, P. A.
Some factors concerned in the mechanism of mitosis.
Cytologia, Tokyo 1955 : **20** : 177–84.

The view is expressed that analysis of mitosis in terms of component cycles, such as those of chromosome movement, spindle development, changes in the nuclear membrane and chromosome morphology, is likely to lead to a more satisfactory understanding of the whole phenomenon than that at present available. The above four cycles are discussed in some detail, and attention is drawn to others also requiring analysis, viz. the cycles of nucleolar changes, chromosome cleavage and cytochemical processes. In addition, the effects of colchicine, Actidione and other chemicals in producing disturbances at prometaphase and subsequent to this stage are considered with reference to their significance in elucidating the mode of control of chromosome movement. It is suggested that not only are the centromere and spindle responsible for movement but also for the constitution of the nuclear membrane and certain morphological transformations of the chromosomes.

1988 IZARD, C. & HITIER, H.
Action de certains antibiotiques et hydrazides sur les divisions cellulaires et le chondriome d'*Allium cepa* L.; action sur les chloroplastes de *Nicotiana tabacum* L. **(Action of certain antibiotics and hydrazides on the cell divisions and the chondriome of *A. cepa* L.; action on the chloroplasts of *N. tabacum* L.).**
Ann. Inst. exp. Tab. Bergerac 1955 : **2** : No. 2 : 15–37.

The effects of dihydrostreptomycin sulphate, framycetin sulphate, maleic hydrazide and isonicotinic hydrazide on the division of root-tip cells of *A. cepa*, on the chondriomes of epidermal cells of the bulb of *A. cepa* and on the epidermal cells of young leaves of *N. tabacum* were studied. All four substances exercised a mitodepressive action, brought about a retardation of cyclosis and caused the chloroplasts to swell and become deformed. Only dihydrostreptomycin sulphate appeared to possess a possible mutagenic effect.

1989 CELARIER, R. P.
Desynapsis in *Tradescantia*.
Cytologia, Tokyo 1955 : **20** : 69–83.

In three desynaptic plants occurring in a population resulting from a cross of two specimens of an unidentified population of *Tradescantia* from Texas, all the chromosomes were completely unpaired during meiosis I, observations being initiated at late diplotene. Meiosis II was essentially normal, regardless of the number of chromosomes involved. The author reviews the literature on desynapsis, referring to a number of economic plants.

1990 SAUERLAND, H.
Quantitative Untersuchungen von Röntgen-effekten nach Bestrahlung verschiedener Meiosisstadien bei *Lilium candidum* L. **(Quantitative investigations of the effects of X rays after irradiation of different stages of meiosis in *L. candidum* L.).**
Chromosoma 1956 : **7** : 627–54.

Irradiation of flower buds of *L. candidum* was carried out to ascertain at which stage of meiosis the chromosomes were most sensitive to the effects of X rays. The strength of the dose was 150 r. in all experiments and anaphase I and II were chosen as the most suitable stages at which to measure the effects of irradiation. The largest number of chromosome breakages and recombinations were caused by irradiation of the premeiotic resting nuclei. Irradiation at as late a stage as pachytene still resulted, however, in a considerable number of chromosome breaks and recombinations.

1991 HAQUE, A.
Effect of infra-red rays on chromosome breakage in *Tradescantia*.
Cytologia, Tokyo 1955 : **20** : 229–36.

Infrared irradiation before or after exposure of the inflorescences to X rays increased the frequency of aberrations in comparison with material treated with X rays only. Interpolation of a heat shock between X irradiation and infrared posttreatment, by immersing the inflorescences in water at 48° C. for 30 sec., enhanced the effect of the infrared rays. It is suggested that with infrared and heat-shock treatments, whether alone or in combination, a greater number of the X-ray-induced breaks are rendered available for reunion at the expense of restitution. Spectrometric measurement showed that only 1% of the infrared rays reached the anthers. No significant rise in temperature was detected in the buds as the result of infrared treatment.

1992 OYAMA, T.
The specific abnormality in cell-divisions by higher dosage of irradiation of X-ray. II. On the inter-relationship between the dose of X-ray and abnormal matrixes of chromosomes.
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 147–50.

In continuation of the investigations summarized in Abst. 886, the author provides data on the relation between frequency of abnormal chromosome matrices in onion root-tips and X-ray dose (500–4000 r). Aberration frequency rose linearly with dose; it also increased with lapse of time after irradiation.

1993 OGIHARA, R.
(The effect of 2,4-D on cell division. Some observations on the root-tip cells of the onion).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1953 : **5** : 37–41. [Japanese].

Chromosome figures resembling the reductional groupings resulting from treatment with colchicine or sodium nucleate were obtained by treating onion root-tips with various concentrations of 2,4-D.

1994 Hyypio, P. A., Te May Tsou & Wilson, G. B.

Some notes on the "c-mitotic" action of colchicine and technical Lindane.

Cytologia, Tokyo 1955 : **20** : 166–76.

Like colchicine, Lindane (containing γ-cyclochlorohexane) impaired the spindle mechanism and induced polyploidy in root-tip cells of onion and pea. Metaphase scattering due to Lindane or colchicine is attributed to the action of the chemical at very early prophase or possibly interphase, causing inactivation of the centromeres and central spindle elements and thus preventing prometaphase configurations. It is suggested that induction of c-pairs does not necessarily lead to polyploidy but often instead to the formation of micronuclei. The main effect of Lindane was the production of scattered metaphases, whereas the primary irregularities caused by colchicine consisted of prometaphase clumping and subsequent prevention of anaphase separation, ascribed to destruction of spindle through action at prophase and delayed cleavage of the centromeres respectively.

1995 Lilly, L. J. & Thoday, J. M.

Effects of cyanide on the roots of *Vicia faba*.

Nature, Lond. 1956 : **177** : 338–39.

Roots were immersed in water or in 5 x 10^{-4} M KCN at pH 7 for 30 min. and nitrogen or oxygen was bubbled through the vessel. With $N_2 + H_2O$ mitosis showed some temporary inhibition and slightly more with N_2 + KCN; $O_2 + H_2O$ had little effect but O_2 + KCN caused a marked and prolonged inhibition. Treatment with O_2 + KCN resulted in chromosome aberrations at anaphase but neither O_2 in the absence of KCN nor KCN in the absence of O_2 induced aberrations. Other experiments, to be reported elsewhere, have indicated that when X irradiation is added to the treatments the effect of KCN in the presence of O_2 in inducing breakage disappears and an effect of KCN in the absence of O_2 is observed instead.

1996 Gläss, E.

Untersuchungen über die Einwirkung von Schwermetallsalzen auf die Wurzelspitzenmitose von *Vicia faba*. (**Investigations on the effect of salts of heavy metals on mitosis in the root tips of *V. faba***).

Z. Bot. 1956 : **44** : 1–51.

Further to experiments reported in Abst. 60 the concentrations of iron, cobalt, nickel, copper, chromium, cadmium, manganese and zinc nitrates required to produce chromosome aberrations in root-tip cells of *V. faba* were determined. An assessment of the number of chromosome aberrations occurring in anaphase and metaphase showed that iron, cobalt, nickel and cadmium nitrates exerted an effect in direct proportion to the concentrations employed. In treatment with copper, chromium, manganese and zinc nitrates, however, the number of aberrations caused bore little or no relationship to the concentrations used. Copper nitrate had the most pronounced effect and manganese nitrate the least pronounced. Treatment for 15 min. gave the maximum number of aberrations in the case of all the above-mentioned substances. The majority of chromosome changes were observed within 2 hr. of treatment, the numbers observed being greater at metaphase than at anaphase. Placing the root tips in a non-nitrate medium immediately after treatment did not reduce the number of chromosome aberrations caused.

1997 Nybom, N.

Some further experiments on chronic gamma-irradiation of plants.

Bot. Notiser 1956 : **109** : 1–11.

In experiments at the Balsgård Fruit Breeding Institute, Sweden, various plants, e.g. *Hordeum distichum 'erectoides 23'*, *Vicia faba*, flax, *Matthiola annua*, *Tradescantia paludosa* and fruit species, were exposed to chronic γ radiation from an outdoor Co^{60} source. Treatment was continuous, or fractionated, with exposure for a 12-hour period during each night or day. As indicated by observations on growth and fertility, tolerance of radiation was not affected by fractionation or by whether irradiation was carried out during the day or night. Chromosome size evidently played an important part in determining specific radiosensitivity; possibly chromosomal disturbances are primarily responsible for the physiological injuries in irradiated plants.

1998 La Cour, L. F., Deeley, E. M. & Chayen, J.

Variations in the amount of Feulgen stain in nuclei of plants grown at different temperatures.

Nature, Lond. 1956 : **177** : 272–73.

Photometric measurements of Feulgen stain in nuclei of roots of species of *Trillium*, *Scilla* and other genera by means of the scanning densitometer devised by Deeley indicated the following: (1) at the control temperature telophase and most interphase nuclei had the 2C amount whereas prophase, metaphase and most of the remaining interphase nuclei contained twice this quantity; (2) smaller 2C and 4C values were detected in plants kept 3–5 days at 0°–6° C., irrespective of whether or not the species contained detectable heterochromatin; (3) the threshold temperature required for inducing the changed values varied according to the species; (4) comparable reductions to those in the root meristem were encountered in the resting nuclei of the differentiated zone; and (5) when cold-treated plants were returned to the control temperature cells about to enter mitosis and those in the differentiated zone attained normal amounts of staining. In an experiment on two plants of *S. campanulata*, a temperature of 36° C. caused reductions in C values comparable to those obtained by low-temperature treatment.

1999 Rutishauser, A. & La Cour, L. F.
Spontaneous chromosome breakage in endosperm.
Nature, Lond. 1956 : **177** : 324–25.

Frequency of breakage was high in endosperms from crosses of *Paris quadrifolia* ($2n = 20$) ♀ with *Trillium grandiflorum* ($2n = 10$) or *T. cernuum* ($2n = 10$) as ♂ but low in *T. grandiflorum* ♀ x *P. quadrifolia* ♂. Breakage, followed by reunion, was confined to the *Trillium* chromosomes and occurred in both euchromatic and heterochromatic segments. Breakage was very unequally distributed among the different chromosomes and chiefly affected chromosome E. Within E breakage was nonrandomly distributed.

2000 Baranov, P. A. & Lebedev, D. V.
(**Discussion concerning the importance of polyploidy and Heribert Nilsson**).
Bot. Ž. (Bot. J.) Moskva 1955 : **40** : 548–52. [Russian].

The Mičurinist arguments against the use of polyploidy, together with Nilsson's critical remarks on polyploids, are rejected (cf. *PBA*, XXV, Abst. 2705). It is urged that this kind of work, which has been suspended in the Soviet Union for a number of years, be resumed.

2001 Funke, C.
Eine Schnellmethode zur Selektion polyploider Pflanzen. (**A rapid method for the selection of polyploid plants**).
Naturwissenschaften 1956 : **43** : p. 66.

The method described consists of immersing mature pollen grains in a mixture of one part of concentrated sulphuric acid to three parts of 2–3% Methyl Blue acetic acid. The cuticle of the pollen pores is dissolved by the mixture and the cytoplasm emerges, forming excrescences which are held in place by the intine. By this means the number of pollen pores, which was found to be 3 in the case of diploid plants and to vary from 3 to 6 in the corresponding tetraploids, may be readily ascertained under the microscope. This technique was efficacious in differentiating between diploid and tetraploid forms of *Antirrhinum majus*, *Polygonum convolvulus*, *Lycopersicon esculentum*, *Trifolium* spp., *Ornithopus sativus* and *Medicago lupulina*. In the case of Crucifers, the above method was slightly modified in that unripe pollen grains from indehisced anthers were used. When the pollen grains were immersed in the previous mixture or in pure Carmine acetic acid the pollen pores were distinguishable as small indentations on the surface of the pollen grains.

2002 Sato, Z.
(**On induction of polyploidy by means of aurantia and the mechanism of the change**).
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 12–16. [Japanese].

Plants of radish and *Pharbitis nil* that had been subjected at the seedling stage to treatment with aurantia showed gigas characteristics, and cytological examination confirmed that the radish plants were tetraploid. C-mitotic figures were also observed in onion root-tips treated with aurantia.

2003 Gerola, F. M.
Azioni tossiche di escreti e secreti fungini sopra l'attività cellulare. (**Toxic action of fungal excretions and secretions on cellular activity**).
Atti Ist. veneto 1950–51 : **109** : 75–82; and Lav. Bot., Padova 1953 : **17** : No. 3.

Phenomena of preprophase inhibition and c-mitosis were observed in root tips of wheat seedlings grown in extracts of *Alternaria* sp. and *Russula linnaei*, being due, it is thought, to an increase in the viscosity of the cytoplasm. The activity of the extracts was gradually reduced by the wheat seedlings, partly owing to the absorption of the Ca ions.

2004 Tischler, G.
Der Grad der Polyploidie bei den Angiospermen in verschiedenen Grossarealen. (**The degree of polyploidy in angiosperms in different large areas**).
Cytologia, Tokyo 1955 : **20** : 101–18.

From an analysis of the floras of Spitzbergen, Sweden, Great Britain, Central Europe, Hungary, the Cyclades and other regions of Europe in terms of the degree of polyploidy of their component species, it is shown that, omitting species which include both diploid and polyploid races, the ratio of polyploid to diploid species increases markedly from south to north in both monocotyledons and dicotyledons.

2005 MAKINO, S. & NAKAHARA, H.
Study of cell division by phase microscopy.
J. Hered. 1955 : **46** : 245–51.

A description of a hanging-drop method for studying cell division by phase contrast microscopy is accompanied by an account of observations on animal cells.

BOTANY

2006 SCHNEIDER, G.
Wachstum und Chemotropismus von Pollenschläuchen. (**Growth and chemotropism of pollen tubes**).
Z. Bot. 1956 : **44** : 175–205.

A study of the growth of pollen tubes in the stigmas of *Oenothera berteriana* and *Oe. odorata*, isogametic complex heterozygotes carrying B.l. and v.I. respectively, showed that selective fertilization in these two species (cf. *PBA*, XXIV, Abst. 842) is due to differences in the degree of chemotropic attraction between pollen tube and ovule. In some cases, mixed pollination resulted in mutual inhibition of pollen-tube growth.

2007 POLJAKOV, I. M.
(I. V. Mičurin's theory of fertilization in the light of new experimental data).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1955 : **16** : 368–82. [Russian].

Mičurinist theories of selective and multiple fertilization are expounded and recent research by the author and others on this topic is surveyed (cf. Abst. 82).

2008 SCHWEMMLE, J. & SIMON, R.
Der Samenansatz bei *Oenotheren*-Kreuzungen. (**The seed set in *Oenothera* crosses**).
Planta 1956 : **46** : 552–68.

Differences between 10 species of the section *Raimannia* in the number of seeds they set when pollinated with pollen of *Oe. hookeri* are attributed to genetically determined differences in the chemotropic effect they exercise on the pollen tubes of *Oe. hookeri*. Similarly, when *Oe. hookeri* was used as the ♀ parent it was observed that the pollen tubes of the 10 other species differed considerably in the intensity of their reactions to the chemotropic attraction of the egg cells of *Oe. hookeri*.

2009 ERNST, A.
Untersuchungen zur Phänanalyse, zum Fertilitätsproblem und zur Genetik heterostyler Primeln. 4. Die F_2-F_5-Nachkommenschaften der Bastarde *Pr.* (*hortensis* x *viscosa*). Erster Teil. [**Investigations on phenotypic analysis, the fertility problem and the genetics of heterostylous primulas. 4. The F_2-F_5 progenies of *P.* (*hortensis* x *P. viscosa*) hybrids. Part I**].
Arch. Klaus-Stift. VererbForsch. 1955 : **30** : 2–137.

The results of genetical studies on the inheritance of heterostyly in the F_2–F_5 of hybrids between *Primula hortensis* and *P. viscosa* are presented (cf. *PBA*, IX, Abst. 146 and XXV, Abst. 2727).

DISEASES, INJURIES, BACTERIA, FUNGI, VIRUSES

2010 CAVALLI-SFORZA, L. L. & JINKS, J. L.
Studies on the genetic system of *Escherichia coli* K-12.
J. Genet. 1956 : **54** : 87–112.

"Genetic analysis of *Escherichia coli* K–12 shows that the unequal genetic contribution of the two parents to the progeny can be explained by the assumption of a highly localized disturbance in segregation, whereby a locus or small region *E* of a chromosome is contributed to most of the progeny by the *F*-parent only. The position of this region *E*, as inferred from haploid segregation data, shows a remarkable correlation with the position of the 'eliminated segment' which is haploid, and mostly of *F*-origin, in otherwise diploid 'heterozygotes'. In addition, segregations are disturbed by irregular pairing, which determines apparent negative interference, and seriously biases the assessment of gene order and estimation of linkage unless taken in proper consideration. The simplest representation calls for a single linkage group, carrying in the middle the elimination locus *E*, and thus dividing the single chromosome into two practically independent segregation groups. Although this picture may need further refinement, as there may be more than one elimination locus or break defining the extremes of the eliminated region, it has permitted consistent mapping of the markers investigated so far.

"The *Hfr* mating-type behaves as a locus close to, or identical with, *E*. The possible relationships of *E*, *Hfr*/*F* and the lambda prophage have been discussed." [Authors' summary].

2011 CAMIEN, M. N. & DUNN, M. S.
"Back-mutation" of *Lactobacillus casei* 280-16 and 1-tetradecene sensitivity in a "back-mutant" strain.
Arch. Biochem. Biophys. 1956 : **60** : 452–55.

Mutant 280–16 is dependent upon the d-α-hydroxy acid grouping. Compared with the wild type, a variant (280–16B) of this mutant grew at a lower rate in a medium lacking d-α-hydroxy acid. Strain 280–16B was markedly inhibited by 1-tetradecene in a medium without d-α-hydroxy acid but only slightly inhibited in the presence of d-lactic acid.

2012 KOGUT, M., POLLOCK, M. R. & TRIDGELL, E. J.
Purification of penicillin-induced penicillinase of *Bacillus cereus* NRRL 569: a comparison of its properties with those of a similarly purified penicillinase produced spontaneously by a constitutive mutant strain.
Biochem. J. 1956 : **62** : 391–401.

Penicillin-induced penicillinase of strain 569 did not differ significantly in specific gravity, electrophoretic mobility and other physicochemical properties from the penicillinase spontaneously produced by mutant 569/H, derived from 569. The penicillinase of 569 or 569/H was however physicochemically distinct from the penicillinase of the related strain 5/B.

2013 HALL, J. R. & OGSTON, A. G.
Sedimentation and diffusion of samples of penicillinase.
Biochem. J. 1956 : **62** : 401–03.

Four samples of penicillinase, 5/B, 569, 569/H(1) and 569/H(2), were examined by sedimentation and diffusion tests (cf. Abst. 2012). 5/B differed from the others; 569 and 569H(2) appeared to be identical; differences between 569/H(1) and 569/H(2) may have been caused by dissimilarity in the process of purification. With the exception of 569/H(1), all the samples appeared to be homogeneous.

2014 KRASILJNIKOV, N. A.
(**Induced variability in bacteria**).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1955 : **40** : 177–91. [Russian].

Directed changes were obtained in some root-nodule bacteria (*Rhizobium* spp.) and two strains of *Pseudomonas liquefaciens* by culturing them upon filtrates from other species. In this way, nodule bacteria isolated from peas, vetch and *Melilotus* were induced to form nodules on clover roots and those from *Vicia* plants on the roots of *Phaseolus*. The two strains of *Pseudomonas* produced nodules on clover roots.

2015 MCDONALD, D. J.
Segregation of the selective advantage obtained through orthoselection in *Escherichia coli*.
Genetics 1955 : **40** : 937–50.

Two genetically similar strains of *E. coli* differing only in five markers none of which conferred any selective advantage on the strains were allowed to evolve independently through 60 serial transfers. As a result of orthoselection (previously described as periodic selection in *PBA*, XXI, Abst. 2386), two genes conferring a high selective advantage, apparently due to increased growth rate, became established in each of the two strains. The genes in the two strains appear to be allelic and linked to the locus determining reaction to streptomycin.

2016 YUASA, A.
Nucleus and spindle of *Bacillus megatherium* in fission and sporulation.
Nature, Lond. 1956 : **177** : 386–87.

The different stages of mitosis were identified in *B. megaterium* by various staining techniques. The author correlates his observations with those of other investigators of the cytology of this bacterium and *B. cereus*.

2017 HIROTA, Y.
(**Cobalt and nickel resistance in *Escherichia coli*. I. Inhibition of multiplication by cobalt and nickel and cross resistance**).
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 218–22. [Japanese].

Strains of *E. coli* 'K12' selected for ability to grow in the presence of relatively high concentrations of $Co^{\cdot\cdot}$ ions also tolerated the presence of $Ni^{\cdot\cdot}$. The converse held for selections made for $Ni^{\cdot\cdot}$ tolerance.

2018 PLOUGH, H. H. & ROBERTS, M.
High frequency of transduction of genes by bacteriophage in *Salmonella*.
Biol. Bull., Wood's Hole 1955 : **109** : p. 342. (Abst.).

A frequency of one H^+ transduction for every 1000 of the free phage particles isolated from a lysogenic strain of *S. typhimurium* when undergoing occasional lysis is reported. This frequency is almost a thousand times greater than that previously found. The frequency per cell did not depart from the usual magnitude, viz. approximately 1 transduced cell per 10 million. Electron microscope photographs of the phage adsorbed on the cells showed it to be similar in appearance to the larger particles of the even-T series infecting *Escherichia coli*.

2019 BURNETT, J. H.
The mating systems of fungi. I.
New Phytol. 1956 : **55** : 50–90.

"The terminology of mating systems in the fungi is discussed and a new terminology suggested.

"The operation of the principal mating systems recognized is described and it is concluded that the factors which control compatibility are pleiotropic in their effects. This suggests that mating-type factors are, in fact, groups of closely linked genes.

"The evolution of mating systems is reviewed. It is concluded that it is not possible at present to give a general account of the evolution of mating systems. However, it is possible to make suggestions concerning the origin and evolutionary processes involved in some of the systems. Such hypotheses are developed. It is concluded that mating systems have arisen in a variety of ways and that, in the first instance, selection of potential mating-type factors may not have been for their effects upon compatibility." [Author's summary]

2020 WHITTINGHAM, W. F. & STAUFFER, J. F.
The protection of spores of *Penicillium chrysogenum* against the action of ultraviolet radiation.
Amer. J. Bot. 1956 : **43** : 54–60.

Treatment with solutions of sodium cyanide, sodium azide and sodium fluoride or with an oxygen-free N atmosphere afforded some protection against the lethal and mutagenic action of 2750 Å ultraviolet rays.

2021 CAGLIOTI, M. T. & SERMONTI, G.
A study of the genetics of penicillin-producing capacity in *Penicillium chrysogenum*.
J. gen. Microbiol. 1956 : **14** : 38–46.

In seven heterocaryons and seven heterozygous diploids synthesized from among one penicillin-producing strain (+) and four nonproducing strains (p_1, p_2, p_3 and p_4), all derived from strain 47.1564 Wis., the four p mutants behaved as alleles and were all recessive to the wild (+) condition. Two mutations for yellow conidia, y_1 and y_2, also appeared to be allelic, while a third gene for yellow conidia, y_3, was at a different locus. Somatic segregation data from a heterozygous diploid indicate that p is linked with the y_1 and *cy* loci.

2022 OTANI, Y. & TAKAHASHI, S.
(On the selection of fungus strains for liquid fermentation).
Tottori Nogaku Kai Ho/Trans. Tottori Soc. agric. Sci. 1954 : **10** : No. 3 : 200–11. [Japanese].

Data are provided on the diastatic activity of numerous strains of *Aspergillus oryzae*, *A. usamii*, *A. niger*, *A. batatae*, *A. awamori* and *A. inuii*. Lists of superior selections are included.

2023 PATEMAN, J. A.
Polygenic inheritance in *Neurospora*.
Nature, Lond. 1955 : **176** : 1274–75.

Production of giant spores has been found to be a polygenic character in *N. crassa*.

2024 WHEELER, H. E.
Linkage groups in *Glomerella*.
Amer. J. Bot. 1956 : **43** : 1–6.

"Morphological and nutritional mutants of *Glomerella cingulata*, most of which were radiation induced, were used to establish linkage groups in this fungus. The inheritance of 33 mutant characters was studied by isolating and culturing the spores from each of more than 1200 asci produced by 61 crosses, most of which involved four or five heterozygous gene pairs. Each mutant character studied appeared to be controlled by a single gene and in all cases regular Mendelian segregation ratios were obtained. Analysis of segregation data indicated 5 linkage groups representing at least 3 chromosomes: group I with 5 loci, group II with 4 loci, group III with 3 loci and two other groups with 2 loci each. Group I included the *A* and *B* loci at which mating reactions are controlled. Three alleles at each of these loci had been previously identified and one of the mutants studied appeared to have a fourth allele at *B*. All the results obtained indicate that the chromosome complement of this fungus is haploid and that inheritance in *Glomerella* follows the same fundamental laws that are known to be operative in other organisms." [Author's summary]

2025 GARNJOBST, L. & TATUM, E. L.
A temperature-independent riboflavin-requiring mutant of *Neurospora crassa*.
Amer. J. Bot. 1956 : **43** : 149–57.

A multiple-mutant strain, Y30539a, requiring riboflavin in addition to inositol, was obtained asexually from an inositolless strain [Y8743–13(19–5)a (*al*–2 *inos*)] treated with tris-(β-chloroethyl) amine. It was found to contain the following new genes: *rib*–2, affecting riboflavin synthesis and situated in linkage group IV, 12·5–15·5 units from the centromere; *ylo*, causing yellow pigmentation and situated 3·9 units from the centromere in linkage group VI; and *w*, determining nongerminating pairs of white ascospores of normal shape and size. Unlike 51602t (*rib*–1, linkage group VI), Y30539a is independent of temperature in its response to riboflavin. With the exception of one isolate, the *rib*–2 strain was inhibited by isoriboflavin; the resistance of this exceptional isolate depended upon a single gene (*r–isorib*). Although *rib*–1 and *rib*–2 strains form heterocaryons with one another which grow at the wild-type rate at 31° or 34° C., no evidence of an active intermediate substance in the synthesis of riboflavin was obtained in tests of either strain.

2026 OLIVE, L. S.
Genetics of *Sordaria fimicola*. I. Ascospore color mutants.
Amer. J. Bot. 1956 : **43** : 97–107.

Investigations on ultraviolet-induced single-gene mutants for ascospore colour yielded one result of particular interest: an effect of temperature upon crossing-over values was observed.

2027 KØLMARK, G. & GILES, N. H.
Comparative studies of monoepoxides as inducers of reverse mutations in *Neurospora*.
Genetics 1955 : **40** : 890–902.

A comparative study of the mutagenic effectiveness of six different monoepoxides, all able to induce reverse mutations in the purple adenineless mutant 38701 of *N. crassa*, indicated that, in general, epoxy rings carrying side chains with strong electronegative properties and having in consequence an increased positive charge on the terminal carbon atom are more powerful mutagens than those with more weakly electronegative side-chains. It is suggested that the mutation reaction involves negatively charged centres at the site of mutation which react more readily with those epoxides carrying an increased positive charge on the terminal atom of the epoxy ring.

2028 PITTENGER, T. H., KIMBALL, A. W. & ATWOOD, K. C.
Control of nuclear ratios in *Neurospora* heterokaryons.
Amer. J. Bot. 1955 : **42** : 954–58.

The relation between the initial nuclear proportions (X) in controlled inocula consisting of mixtures of homocaryotic conidia and the final nuclear ratio (Y) of the resulting heterocaryons can be expressed by the equation $Y = (\lambda_b/\lambda_a)X^m$, where λ_b/λ_a represents the differential increase of the nuclear types *a* and *b* during heterocaryon formation and *m* "a geometric or functional restriction of the participation of the majority type." Both λ_b/λ_a and *m* appear to vary in different inocula. At high values of X, the final ratio tends to reach an upper limit, the maximum reached under the present experimental conditions being about 80 : 1.

2029 SANSOME, E.
Camphor-induced *gigas* forms in *Neurospora*.
Trans. Brit. mycol. Soc. 1956 : **39** : 67–78.

Gigas strains with microconidia larger than those of the standard strain were induced by camphor treatment. Such strains were unstable, tending to revert to the standard type, and were probably diploids. In crosses involving gigas strains, asci with more than 8 ascospores and many empty perithecia were formed. Cytological investigations revealed an ascus with approximately the 4*n* number in a cross between two gigas strains, and one 2*n* ascus and another with the 3*n* number in a cross between a gigas form and the control. A cross between two gigas strains gave (1) 7 single-ascospore cultures of mating type A, 2 of which were highly fertile and presumably haploid and 5 sterile and presumably diploid, (2) 4 of mating type a, of which 2 were probably diploid and 2 haploid, and (3) 7 neutral cultures.

2030 MITCHELL, M. B. & MITCHELL, H. K.
A nuclear gene suppressor of a cytoplasmically inherited character in *Neurospora crassa*.
J. gen. Microbiol. 1956 : **14** : 84–89.

The cytoplasmically inherited character *poky* (cf. *PBA*, XXIII, Abst. 947), recognized by certain defects in the cytochrome system accompanied by low growth rate, is partially suppressed in the presence of the gene *f*, the growth rate becoming nearly normal but the cytochrome system remaining unchanged. The gene *f* was without effect on a strain carrying the cytoplasmically inherited character *mi*3 or on the nuclear gene mutants C115 and C117, all of which were phenotypically similar to the *poky* strain. A nuclear gene suppressor, *s*, restores to normal both the growth rate and cytochrome system of C115 but is without effect on *poky*, *mi*3 or C117.

2031 Yanofsky, C. & Bonner, D. M.
Gene interaction in tryptophan synthetase formation.
Genetics 1955 : **40** : 761–69.

Twenty-five tryptophane-requiring (*td*) mutants of *Neurospora crassa*, all of which were biochemically similar and appeared to result from mutation at the same locus or at closely linked loci, differed in their reactions to the presence of four specific suppressor genes su_2, su_3, su_6 and su_{24}. The mutant designated td_1 was unsuppressed by any of the *su* genes, while td_2 could be suppressed by su_2 and su_6, td_3 by su_3 and su_{24}, td_4 by su_6 and td_{24} by su_3 and su_{24}.

2032 Bočarov, S. N.
(**Hybridization of industrial yeast strains**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 260–67. [Russian].

New hybrids between industrial strains of *Saccharomyces cerevisiae* have been obtained. Most of them are more active and multiply more rapidly than either of the parent strains.

2033 Zsolt, J.
Filogenetikai vizsgálatok élesztőkön. (**Phylogenetic investigations on yeasts**).
Ann. Biol. Tihany 1954 : **22** : 261–69.

The yeasts are considered to have arisen polyphyletically from filamentous fungi and on the basis of the morphology of experimentally produced variants a possible sequence of evolution from sexual and asexual filamentous types is put forward. Other topics discussed include the development of the ability to produce high concentrations of alcohol and of the ability to utilize sugars other than glucose.

2034 Sreepathi Rao, S. K.
Studies on the cytology of yeasts. XI. Mitosis in an unmodified diploid isolated after long treatment with camphor.
Cytologia, Tokyo 1955 : **20** : 52–61.

A diploid isolated after exposure of the two-chromosome yeast BY1 to camphor for 90 days was indistinguishable in its cytological behaviour from the control, various irregularities in the synchronization of mitotic processes being observed in both. It is suggested that cells showing precocious anaphases may be converted to tetraploids upon the induction of mutation for a stable 4*n* condition.

2035 Wild, D. G. & Hinshelwood, C.
The response of yeast cells to the action of inhibitory substances. I. Sodium azide.
Proc. roy. Soc. 1956 : Ser. B : **145** : No. 918 : 14–23.

When an unadapted 2*n* diploid strain of *Saccharomyces cerevisiae* was plated on a solid medium containing sodium azide, two types of colony appeared: larger "primary" colonies which grew at approximately the same rate as the parent strain, and smaller, slower-growing "secondary" colonies derived from mutant cells. During the early stages of the lag subsequent to inoculation of the parent strain into a liquid medium containing sodium azide, the initial production of the mutants was rapid but thereafter their number remained constant, ultimate growth of the culture depending upon multiplication of the non-mutants. The mutants were not resistant to sodium azide and were apparently formed by the action of the drug only on those cells still temporarily capable of division shortly after inoculation. When repeatedly subcultured in a drug-free medium, the mutant type showed a gradual improvement in growth rate until it approached the parent strain in this respect. The mutants failed to sporulate and differed from the parent strain in efficiency of glucose utilization, response to tetrazolium chloride and absorption spectrum.

2036 Wild, D. G. & Hinshelwood, C.
The response of yeast cells to the action of inhibitory substances. II. Crystal violet.
Proc. roy. Soc. 1956 : Ser. B : **145** : No. 918 : 24–31.

Culture of 2*n* *Saccharomyces cerevisiae* in a liquid medium containing Crystal violet led to the formation of small slow-growing colonies which, unlike the mutants induced by sodium azide, were not at a selective disadvantage. No mutants were obtained by culturing on a solid medium containing this dye. As shown by their uneconomic utilization of glucose and failure to reduce tetrazolium chloride, the mutants were characterized by respiratory deficiencies. Both mutants and nonmutants were capable of adaptation to resist Crystal violet but mutation and development of resistance were not connected. Nonmutants adapted to resist Crystal violet were capable of producing small-colony mutants upon further exposure to the dye.

2037 Wild, D. G. & Hinshelwood, C.
The response of yeast cells to the action of inhibitory substances. III. Janus black and some other agents.
Proc. roy. Soc. 1956 : Ser. B : **145** : No. 918 : 32–41.

Training of a $2n$ strain of *Saccharomyces cerevisiae* in a liquid medium containing Brilliant green may lead to the production of primary and secondary colonies (cf. Abst. 2035). Type of response to training varies according to the inhibitor. Mutants induced by certain of the agents tested by the authors in these and other investigations have their respiratory systems impaired; this alteration persists in spite of successful training on a normal medium. The development of resistance to an inhibitor is not necessarily due to the selection of secondary mutants, which may be at a selective disadvantage or lack resistance. Reasons are given for concluding that resistance is attained by direct adaptation.

2038 Verbina, N. M.
(**Adaptation of yeasts to increased alkalinity of the medium**).
Mikrobiologija (Microbiology), Moskva 1955 : **24** : 681–84. [Russian].

A strain of *Saccharomyces cerevisiae* tolerant of pH = 8·2 was obtained by culturing strain Ja in gradually increased concentrations of KOH.

2039 Kudrjavcev, V. I.
(**The importance of systematics in the breeding of microorganisms**).
Mikrobiologija (Microbiology), Moskva 1955 : **24** : 665–70. [Russian].

Identification of wine yeasts based on the adaptation of each species to its natural habitat is discussed. Nine species of *Saccharomyces* have been identified by this method; *S. vini* (*S. ellipsoideus*) proved to be most valuable for continuous selection under industrial conditions.

2040 Ephrussi, B., Margerie-Hottinguer, H. de & Roman, H.
Suppressiveness: a new factor in the genetic determinism of the synthesis of respiratory enzymes in yeast.
Proc. nat. Acad. Sci. USA 1955 : **41** : 1065–71.

Two types of respiration-deficient mutants of *Saccharomyces cereviseae* have been distinguished, viz. neutral (n) and suppressive petites (s). The results from crosses of the two types with normal yeasts (N) are interpreted by the following hypothesis. N cells carry a cytoplasmic factor controlling the synthesis of respiratory enzymes. In n cells this component has been lost or has undergone alteration to a functionally neutral condition whereas in s cells it has mutated to the capacity of suppressing the perpetuation of the cytoplasmic factor.

2041 James, A. P. & Lee-Whiting, B.
Radiation-induced genetic segregations in vegetative cells of diploid yeast.
Genetics 1955 : **40** : 826–31.

Allelic gene pairs at five loci, which together with the centromeres were found to comprise three linkage groups, *A* — centromere, *G* — centromere and (G_2–T_r) — centromere, and one unlinked locus, *ur*, were used to investigate the induction of genetic segregation by ultraviolet radiation in vegetative cells of diploid *Saccharomyces cerevisiae* (cf. *PBA*, XXV, Absts. 2776 and 2798). The occurrence of a positive correlation between the frequency of induced homozygosis and distance from the centromere rather than a negative correlation or a lack of correlation, either of which would suggest that first meiotic division is the mechanism by which segregates are produced, indicates that mitotic crossing-over is involved. Neither reciprocal translocation nor induced meiosis followed by fusion of the haploid products seems to be of importance.

2042 Loginova, L. G.
(**A thermophilic strain of yeast obtained experimentally**).
Vestn. Akad. Nauk SSSR (Rec. Acad. Sci. USSR) 1955 : No. 10 : 63–66. [Russian].

A thermophilic strain of *Saccharomyces cerevisiae*, obtained by culturing at progressively higher temperatures, fermented maltose and multiplied more rapidly at 40° C. than the parent strain. Changes in morphology and nutritional requirements also occurred.

2043 Descharmes, M. & Villoutreix, J.
Action de l'irradiation ultraviolette sur *Rhodotorula mucilaginosa*. Obtention de mutants diversement colorés. Étude de leur teneur en stérols. (**Effect of ultraviolet irradiation on *R. mucilaginosa*. Production of variously coloured mutants. Study of their content of sterols**).
CR Soc. Biol., Paris 1955 : **149** : 1453–55.

Pink, yellow and orange strains were obtained by exposing cultures of *R. mucilaginosa* to ultraviolet rays. No evidence could be obtained that the enzyme system responsible for the synthesis of sterols was in any way affected.

2044 WINGE, Ö. & ROBERTS, C.
Complementary action of melibiase and galactozymase on raffinose fermentation.
Nature, Lond. 1956 : **177** : 383–84.

Hydrolysis and fermentation of raffinose by yeast may be accomplished through the activity of R_1, R_2 or R_3. Evidence has now been obtained that raffinose may also be fermented by the complementary action of *Me* for melibiase and *G* for galactozymase. *Me* alone is responsible for the hydrolysis of raffinose into sucrose and galactose, the latter being fermented by galactozymase produced through the action of *G*. If R_2 is also present, fermentation of raffinose is complete, the sucrose being hydrolysed into fructose and glucose by β-h-fructosidase. The gene g_s for slow fermentation of galactose brings about the slow fermentation of raffinose in cooperation with *Me*.

2045 KOBEL, F.
Zur Nomenklatur des Zwergbranderregers.
(**On the nomenclature of the dwarf bunt pathogen**).
Phytopath. Z. 1956 : **26** : 31–34.

Spores of the organism causing dwarf bunt of wheat were morphologically identical with those causing dwarf bunt on *Agropyron* spp. Infection of *Agropyron* spp. with spores taken from wheat plants was unsuccessful, as was also the infection of wheat with spores from *Agropyron* plants. It is suggested that two forms of the species *Tilletia controversa* be recognized, viz. *T. controversa* f. *tritici* and *T. controversa* f. *agropyri*.

2046 RAABE, R. D.
Variation in pathogenicity of isolates of *Armillaria mellea*.
Phytopathology 1955 : **45** : p. 695. (Abst.).

Isolates from pines, juniper, peach, pear and other species from various areas in the USA showed marked differences in virulence when tested on peach, pine and *Dahlia* seedlings.

2047 BAWDEN, F. C.
Reversible, host-induced, changes in a strain of tobacco mosaic virus.
Nature, Lond. 1956 : **177** : 302–04.

A Nigerian mosaic-virus strain isolated from *Vigna sinensis* has exhibited much greater changes in pathogenic and other properties than any strain previously described, these changes being reversible upon return to the appropriate host. The properties manifested depend less upon those of the virus in an inoculum than on the identity of the plants inoculated and the conditions under which they grow. No evidence was obtained that the virus is a mixture whose components multiply differentially. Probably the genetic material remains unaltered and the different forms may be regarded as the equivalents of phenotypic variations, indicating the wide range of proteins capable of combining with the same nucleic acid according to the environment encountered by the initial infecting particles. It is noted that an Indian strain of sunn hemp mosaic has also undergone similar alterations upon passage through different hosts.

2048 VOVK, A. M.
(**Changing the green mosaic virus of cucumber into the white mosaic virus**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 237–59. [Russian].

A directed change of green mosaic virus 2 into white mosaic virus 2A occurred when cucumber plants infected with green mosaic virus 2 were subjected to temperatures above 30° C. The initial and the new virus strain were antagonistic.

2049 SUHOV, K. S.
(**Variability and the origin of species in viruses**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 20–40. [Russian].

Recent research dealing with viruses is discussed from the viewpoint of Lysenko genetics.

2050 STREISINGER, G.
The genetic control of ultraviolet sensitivity levels in bacteriophages T2 and T4.
Virology 1956 : **2** : 1–12.

"The difference in ultraviolet sensitivity between bacteriophages T2 and T4 behaves as a unit character in crosses and is linked to the r_{17} locus of T2L. The same locus controls the level of UV sensitivity, the extent of photoreactivability, and the evolution of intracellular UV sensitivity during phage development. Genotype and phenotype with respect to levels of UV sensitivity always seem to coincide."

[Author's summary]

2051 GAREN, A. & ZINDER, N. D.
Radiobiological evidence for partial genetic homology between bacteriophage and host bacteria.
Virology 1955 : **1** : 347–76.

The lytic and lysogenizing activities of a temperate phage (P22) of *Salmonella typhimurium* and the lytic activity of a virulent mutant of this phage were all inactivated at equal rates by ultraviolet radiation (UV) and by decay of incorporated P^{32}. Transducing ability was not significantly reduced by high doses of either agent. Lytic and lysogenizing activities therefore appear to involve equal amounts of the deoxyribonucleic acid (DNA) of the phage, and transduction a lower amount. Sensitivity of P22 and T2 to inactivation (loss of capacity to form plaques) by decay of P^{32} and by X rays was directly proportional to the DNA content of the phage, but with UV treatment no constant relationship between sensitivity and DNA content was detected. Data have been obtained suggesting that the high degree of resistance shown by P22 to UV radiation may be attributed to reactivation caused by exchange of damaged phage material for undamaged homologous material from the host.

2052 Boyd, J. S. K.
Bacteriophage.
Biol. Rev. 1956 : **31** : 71–107.

This comprehensive review of recent research includes discussions of the various genetical aspects of bacteriophage behaviour.

2053 Kaiser, A. D.
A genetic study of the temperate coliphage λ.
Virology 1955 : **1** : 424–43.

"1. All the known markers in the temperate phage λ are linked to each other.

"2. Mating between pairs of intracellular particles occurs at random with respect to partner but is rather rare (average number of rounds of mating 0·5, assuming two reciprocal recombinants are formed simultaneously).

"3. Double crossing over in a single mating event occurs frequently in λ.

"4. There appears to be little or no interference between two crossovers which occur in the same mating event.

"5. No correlation between reciprocal recombinants in single bursts is found."

[Author's summary]

2054 Cairns, H. J. F. & Watson, G. S.
Multiplicity reactivation of bacteriophage.
Nature, Lond. 1956 : **177** : 131–32.

The data obtained by Dulbecco are in agreement with the recombination theory of multiplicity reactivation, provided the frequency distribution of cell sizes of the bacteria is included in the calculation of the survival rates of the multicomplexes of phage particles (cf. *PBA*, XIX, Abst. 2436 and XXII, Abst. 2496).

CROP PLANTS

2055 Justesen, S. H. & Kalamkar, R. J.
Background course in Agriculture. Training centre in experimental designs and survey techniques of experimentation. New Delhi, India.
FAO, UN, Rome 1954 : FAO/55/8/5479 : InDEx/4 : Pp. 71. (Mimeographed).

Part I deals with agronomic topics and includes outlines of the essentials of the procedures used in the selection and breeding of maize, rice, sugar cane and rubber. Part II is devoted to general principles of breeding and consists of (1) a short elementary account of methods by B. P. Pal, (2) an explanation of Mendelian laws by S. M. Sikka and (3) an introduction to statistical methods by V. G. Panse. Part III is concerned with insect pests and diseases.

2056 **Crops and plant breeding.**
J. R. agric. Soc. 1955 : **116** : 100–10.

Recent work on cereals, grasses, clovers, sugar beet and potatoes is surveyed. The topics discussed include the following: the performance of varieties of wheat, barley, oats and potatoes provisionally recommended by the National Institute of Agricultural Botany; chromosomal differences between oat varieties and hybrid sterility (cf. *PBA*, XXV, Absts. 966 and 1924); and techniques used in potato breeding in the Netherlands (cf. *PBA*, XXIV, Abst. 2148 and XXV, Abst. 368).

2057 Das Institut für Kulturpflanzenforschung im Jahre 1954. (**The Institute for Research on Crop Plants in the year 1954**).
Kulturpflanze, Berlin 1955 : **3** : 5–23.

The work of the Department of Genetics and Cytology during 1954 is outlined briefly. Studies on the induction of mutations in *Antirrhinum* were continued (cf. *PBA*, XXV, Abst. 1544) and information was obtained on heterosis and the genetical basis of the inheritance of anthocyanins in *Antirrhinum*. Economically valuable mutants of winter and spring barley were obtained by X irradiation (cf. *PBA*, XXIV, Abst. 2004 and XXVI, Abst. 2333). Experiments were carried out on heterosis and on vegetative hybridization in tomatoes (cf. *PBA*, XXV, Absts. 1491 and 2467) and on the inheritance of bitterness, short vines and testa characters in *Cucurbita pepo* (cf. *PBA*, XXV, Absts. 2465 and 2467). Caryological studies were carried out to determine the chromosome numbers of thyme and savory (cf. *PBA*, XXV, Abst. 2543). Contributions were made to the systematics of lettuce and tomatoes (cf. *PBA*, XXV, Absts. 2461 and 2494).

2058 STEHLÍK, V.
Přednášky ze zušleohťování pro kurs agronomů STS. (**Lectures on breeding for a course of state-farm agronomists**).
Vysoka Škola Zemědělská, Brno 1955 : Pp. 89. (Mimeographed).

General instructions on plant breeding work based on Mičurin-Lysenko genetics, together with detailed schemes of selection for cereals, forage plants, potatoes, root crops, legumes grown for seed and a number of oil plants, are presented.

2059 ŠEVČUK, T. N.
(**Some questions concerning plant production in Czechoslovakia**).
Zemledelie (Agriculture) 1955 : No. 12 : 99–104. [Russian].

Mention is made of new sugar beet varieties, with a sugar content up to 24·6%, from the Sugar Beet Institute. Reference is also made to improved potato varieties bred in recent years at the Potato Institute. They include Krasava which contains 14–16% starch.

2060 HRUŠKA, L.
Semenářské dílce. (**Seed plots**).
Statní zemědělské Nakladatelstvi, Praha 1954 : Pp. 146.

The organization of breeding work on common agricultural plants in Czechoslovakia is discussed and general instructions on seed production are given. Recent standard varieties of wheat, oats, rye, maize, barley, potato, beets, winter rape, linseed and peas for a number of districts are listed.

2061 TARR, L.
(**Hungarian science at the service of agriculture**).
Priroda (Nature), Leningrad 1955 : No. 12 : 62–65. [Russian].

Among the achievements in plant breeding, mention is made of the maize hybrid 5 from Martonvásár. It outyielded varieties and hybrids that have recently been tested in Hungary and Austria. Reference is also made to new productive disease-resistant potato varieties bred at Kisvard and tomatoes characterized by earliness from Kecskemét.

2062 BOCETA DURÁN, V.
Mejora de plantas y su proyección en la economía agrícola. (**Plant breeding and its projection into agricultural economics**).
Agricultura, Madr. 1955 : **24** : No. 284 : 739–42.

Improvements resulting from plant breeding are illustrated by citing a rise in yield of bread cereals of 15–33% since 1920 in Germany, of 50% for wheat in southern Sweden and Italy, 24% in Canada and 30–50% in Uruguay, and increases of the order of 22,000 million kg. as resulting from the use of hybrid maize in the USA. It is further calculated that an expenditure of two million pesetas annually on experimental work on hybrid maize in Spain would make it possible to raise the annual value of the crop by 456 million pesetas.

2063 PISAREV, V. E.
(**Along the road of Mičurin**).
Zemledelie (Agriculture) 1955 : No. 10 : 37–42. [Russian].

An account of breeding work on cereals at Nemčinovka, with references to distant hybridization, open pollination, vegetative rapprochement and other Mičurinist methods, is given.
Wheat. The new winter varieties Nemčinovka 1 and Soviet were obtained by open pollination. They surpass the standards of the Moscow province in yield and grain quality. Moskovka has been improved by selection and has given rise to a new red-grained strain Novomoskovka [New Moscow], which is characterized by a longer post-harvest maturation period than the initial variety.
Buckwheat. By grafting cultivated buckwheats on tetraploid stocks of *Polygonum tataricum*, a tetraploid form of buckwheat was produced which outyields the standard Voznesenskaja by 20–25%.
Oats. Nemčinovka 1 was bred from A315 originating from Moscow, and the Swedish variety Orel [Eagle]. It outyields Orel by 4 c. per ha.
Rye. A hybrid between German and Soviet strains has been produced. It is distinguished by firm short straw. Podmoskovnaja [Environs of Moscow], which produces ripe grain in the Moscow province in most seasons, has been bred.
Barley. Golozernyĭ Gibrid [Naked-seeded Hybrid] (Kolhoznyĭ [Collective Farm] x Viner) has been developed. It is more productive than Viner and is suitable for combine harvesting. The grain has a high protein content.
Setaria. Moscow 2, Moscow 4 and Nemčinovka 6 have been selected for earliness from introduced and local material.

2064 KOZLOV, A. D.
(**Divorced from practice**).
Zemledelie (Agriculture) 1955 : No. 11 : 113–20. [Russian].

Breeding work on wheat, buckwheat, millet, vetch and sunflower at the Aleksandrov state breeding station is criticized for lack of practical results. It is stated that of the 15 varieties submitted for varietal tests in recent years only a buckwheat and a sunflower variety have been made standards.

2065 Arbetsplan för Weibullsholms Växtförädlingsanstalt för år 1956. (**Programme of work of the Weibullsholm Plant Breeding Institute for the year 1956**): Pp. 45.

Current breeding work on cereals, forage crops, root crops, oil plants and vegetables at Weibullsholm, Sweden, is surveyed and the breeding programme for 1956 is outlined.

2066 ANDERSSON, G.
Sveriges Utsädesförenings årsmöte i Svalöf den 19 juli 1955 (gemensamt med Skånes Oljeväxtodlareförening). [**The annual meeting of the Swedish Seed Association at Svalöf on 19 July 1955. (Held jointly with the Skåne Association of Oil-crop Growers**)].
Sverig. Utsädesfören. Tidskr. 1955 : **65** : 297–308.

A report of this meeting was summarized in Abst. 116 and included an account of recent work on wheat, rye and oil crops. In addition to the above, mention is made in the present report of the following promising varieties: the oat lines Sv01671 and Sv01672 (Stjärn [Star] x Örn [Eagle]); the winter barley selection 50/19 from Bore, probably to be marketed under the name Bore II; the stiff-strawed and productive two-rowed barley Sv50/102 (Morgenrot [Dawn Red] x a sister line of Ymer), which appears to be of good malting quality; the extremely stiff-strawed two-rowed barleys Sv50/109, Sv51/148 and Sv52/127; the early, stiff-strawed, six-rowed barley Sv06100 (Marockanskt korn [Moroccan barley] x Edda); the fodder pea Bello (Hero x Artturi); the highly productive timothy Sv0836; the high-yielding flax varieties Sv0222, Sv0261b and Sv0301b$_2$; and the monecious hemp Mona. The perennial ryegrass Viktoria has been crossed with the Swedish local variety Valinge in an attempt to combine the productivity of the former with the winter hardiness of the latter. A number of tetraploid red clovers have outyielded the best diploid varieties. An X-ray induced mutant of Fylking has more rapid spring growth and better seed-setting capacity than its parent.

2067 TEDIN, O.
Skillnaden mellan så kallade officiella försök och växtförädlingsanstalternas egna. (**The difference between the so-called official trials and those of the Plant Breeding Institutes**).
Allmänna Svenska Utsädesaktiebolaget, Svalöf 1956 : 6–8.

It is pointed out that the local Swedish national trials are often conducted by local farmers or associations without sufficient expert supervision, so that the results are frequently unreliable compared with those of the permanent state trials or private breeders' trials which are kept permanently under the observation of trained personnel.

2068 WIKLUND, K.
Svalöfsförädlingen för Norrland. (**Breeding for Norrland at Svalöf**).
Allmänna Svenska Utsädesaktiebolaget, Svalöf 1956 : 31–36.

The chief breeding objectives for Norrland, Sweden, are earliness and winter hardiness. Recent varieties which have shown promise in Norrland include the hardy timothy strain Bottnia II, which has good resistance to fungous diseases; the hardy Alsike clover Kurir [Courier], which, although inferior to Svea in the first year's growth, is superior in subsequent years; an early fodder pea Nola II; and the early oat variety Nip, which however has performed less well than the older and later variety Same.

2069 DAM KOFOED, A.
55. Beretning om planteavlsarbejdet i landboforeningerne i Jylland. (**55th report on the plant cultivation work of the agricultural associations of Jutland**) : 1955 (1956) : Pp. 719.

This report of the results of numerous local field experiments carried out by agricultural associations throughout Jutland, Denmark, includes details of varietal trials of wheat, oats, rye, barley, potato, swedes and mangels.

2070 Stations fédérales d'essais agricoles, Lausanne. Rapport d'activité 1954. (**Federal Agricultural Research Stations, Lausanne. Report of activity, 1954**).
Landw. Jb. Schweiz 1955 : **69** : 592–869.

In addition to the crops listed below mention is made of breeding work in progress on *Dactylis glomerata* and *Arrhenatherum elatius* and of variety trials of root crops, fruit, lucerne, red clover and asparagus.

Wheat. Crosses have been effected between the Swiss varieties Probus and MC245 on the one hand and the German variety Taca, the French variety Cappelle Desprez, the Austrian variety Admonter 97 and the Australian varieties Ridley, Dundee, Dirk, Wongoondy, Charter and Gabo on the other. The Swedish variety Svenno was crossed with the Canadian varieties Redman and Regent. The F_2 of crosses of Probus with *Triticum dicoccum*, *T. durum*, *T. turgidum* and *T. persicum* are being studied. The majority of the F_2 and F_3 back crosses of Probus x *T. timopheevi* and MC245 x *T. timopheevi* to the cultivated parents are male sterile. Cappelle, Heine VII and Admonter 97 have been crossed with *T. timopheevi*, *T. dicoccum*, *T. durum*, *T. turgidum* and *T. persicum*. In *Triticum* x *Secale* crosses, a number of F_3 plants possessing good fertility and resembling the *Triticum* parent have been obtained. The results of crosses of *Triticum* spp. with *Agropyron intermedium* and *Aegilops* spp. are reported. In variety trials of winter wheats, Cappelle and Heine VII gave high yields and Carsten VI and the French variety FD732 proved highly resistant to lodging. Probus and MC245 possessed the best resistance to winter frosts.

Oats. The variety Lang Doerflers gave high yields in variety trials. The Dutch spring oat Marne proved highly productive and possessed good resistance to lodging. Pajbjerg Regent, Grossmogul and Palu were also highly resistant to lodging. The hybrid Oe. 263 (Huron x Newthatch) possessed a high degree of resistance to black rust. The German variety Lichti I surpassed the Swiss standard Huron in earliness, productivity and resistance to lodging.

Rye. The fertility of autotetraploid lines of Rothenbrunnen, Berna, Witzwil and Petkus has been improved to 72–88% by a programme of rigorous selection. In trials of winter rye, Carsten gave the highest yields of grain. Its frost resistance was, however, unsatisfactory.

Maize. Crosses were carried out between a number of inbred lines with a view to obtaining commercial hybrids possessing the same yielding capacity and disease resistance as W270 but maturing earlier than this American introduction. Good results have been obtained from experimental three-way crosses.

Barley. Tetraploid lines of Riniker, Austral, Freja, Kenia and Isaria are being studied. Except in the case of Isaria, fertility is low. In trials of winter barleys, Firlbeck I, Hauter and Engelen 264/757 gave the highest yields and proved resistant to lodging. Of the spring barleys tested, Domen and Piroline proved highly resistant to lodging. Good yields were obtained from Carlsberg II and the early-maturing variety Bonus. The experimental line BJM34 proved highly productive and possessed good resistance to mildew and lodging.

Tobacco. Work is in progress on breeding for resistance to nematodes, *Thielaviopsis* sp., virus diseases and wild fire.

Tomato. The results of extensive variety trials are tabulated. Export Wunder [Export Marvel], Unic and Gouden Ster [Golden Star] gave the highest yields.

2071 Baĭlov, D.
(**Scientific work on plant production in the Bulgarian People's Republic**).
Za socialist. seljskohozjaĭstv. Nauk. (For socialist agric. Sci.) Praha 1955 : Ser. A. No. 4 : 439–52. [Russian].

Cereals. New productive varieties bred at various institutes include such wheats as the very winter-hardy variety 14 from Rusa and Åkerman from Sadovo which yields up to 65 c. per ha. High yielding rye varieties have been bred at Sofia and Sadovo. Mention is made of the heterotic maize hybrid Maksimirskiĭ Konskiĭ Zub [Maksimir Dent] x Čirpan and of some new barleys characterized by winter hardiness and drought resistance.

Beet. Reference is made to Endže, a new productive sugar beet, and to Vrana, a mangel distinguished by a high dry matter content.

Fibre plants. The cotton varieties 38 from Čirpan and Malkov from Sadovo are notable for high yield, earliness and good length of fibre. The hemp variety G–3 bred at Plovdiv surpasses Bulonskaja [Boulogne] in productiveness and fibre quality.

Tobacco. High-quality aromatic varieties have been developed, among them Rila 9 notable for productiveness, the early variety Nevrokop 5 and Kozarsko 541 and Ustinskiĭ 4, which are resistant to *Thrips tabaci*. Ustinskiĭ 4 also shows resistance to *Thielavia basicola*.

Sunflower. New varieties resistant to *Orobanche* are reported.

Tomato. Some heterotic crosses are mentioned.

2072 Prjadčenku [Priadcencu], A.
(**Achievements in breeding agricultural plants**).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1955 : **16** : 413–22. [Russian].

Breeding work in Rumania on cereals, vetch, potato, fibre plants, sugar beet and other economic plants, together with the Mičurinist methods employed, is described.

Cereals. A number of winter wheats have been trained for the spring habit. The best among them was obtained from Tîrgu-Frumos 27 (A 15 x Early Blackhull). It ears at the same time as Marquis, has large vitreous grain and outyields Akademija RNR 48 [Rumanian Academy 48], the standard in the Moldova province. Work on the development of wheats with branched ears and barley x wheat and rye x wheat hybrids is reported. Winter oat varieties have been obtained by training the spring varieties Tîrgu-Frumos 9 and Cenad 749 for the winter habit. They are productive and have grain of improved quality. By transferring the embryo of the Abed barley Opal to the endosperm of the barley Isaria, forms characterized by greater earliness and increased yield have been obtained. Productive new varieties of cereals have been selected among local populations. They include a winter form of Arnautka wheat notable for productiveness and resistance to diseases, especially to smut.

Vetch. Breeding for hardiness is being pursued by vegetative hybridization of *Vicia sativa* with *V. pannonica*, *V. villosa* and other species.

Potato. Heritable properties of most varieties have been improved by summer sowing. Željtyĭ Ranniĭ [Early Yellow] and Viola surpassed all other early varieties in yield and degree of resistance to drought and diseases. Merkur, Sèpunar and Priska were the best late varieties in these respects. Reference is made to work on vegetative and distant hybridization. Wide crossing involved *S. demissum*, *S. andigenum* and *S. acaule* and included the use of vegetative rapprochement.

Fibre plants. Work on the introduction and acclimatization of a number of fibre plants is reported. A form of cotton with the O type of branching has been selected from IKAR 392–6. It is 2–10 days earlier than Odessa I and has 0·1–1·5 mm. longer fibre, but its fibre yield is 1–3% below Odessa I. A new variety of *Abutilon*, IKAR 3, has been selected from a Manchurian population and a variety of kenaf from Indonesian material. The former yields 1300 kg. fibre per ha. and the latter 4000–8800 kg. dried stems with a fibre content of 17–19%.

Sugar beet. The new standards Lovrin 532 for the Banat and Cîmpia Turzii 34 for Transylvania have been developed. These varieties produce 5–7% more sugar per ha. than the older ones and Cîmpia Turzii 34 also shows resistance to *Cercospora.*

2073 **(New varieties raised by the Ministry of Agriculture and Forestry in 1954. IV. Mint and tea).**
Ikushugaku Zasshi/Jap. J. Breeding 1954 : **4** : p. 126. [Japanese].

Brief descriptions are given of the disease-resistant mint variety Suzukaze [Cool Breeze] (Nantsu x Hoko 2), the tea selections Natsumidori, Yaeho, Asagiri, Kiyomidori and Hatsumidori, and the tea hybrid variety Benikaori (Ai 21 x 0.3); the tea varieties are of special interest on account of their resistance to cold weather and diseases.

2074 **(Synopsis of new varieties of crop plants for the summer of 1955).**
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : p. 130. [Japanese].

Potato. Unzen (Norin 6 [Ministry of Agriculture and Forestry 6]), from Norin 1 x Katahdin, is a midlate potato with yellowish-white tubers, tolerant of summer warmth. Tachibana (Norin 7), of the same parentage as Unzen and also a midlate variety with yellowish-white tubers, is recommended as an autumn or winter variety.

Sweet potato. Benisengan (Norin 19), from Norin 2 x Kyushu 12, is a high-yielding variety with red-skinned tubers. Setoaka (Norin 20), from Kyushu 12 x Gokoku [Defence of the Country], is a high-yielding type with pale purplish-red tubers.

Flax. Aosegi (Norin 1), from 3633–25–5–1–9–4 x strain 23, is an improved strain suitable for Hokkaido.

2075 **Annual Report of the East African Agriculture and Forestry Research Organisation for 1955** : Pp. 116.

Maize. The possibility of improving maize for use in native areas by Brieger's technique is being explored. Attention is being given to sibbing as a means of attaining the same ends as those of selfing, with less loss in vigour. In tests of Peruvian x Muratha derivatives and inbred Peruvian stocks, approximately 20% of the seedlings showed resistance to streak. Greenhouse tests of the reaction of seedling leaves to inoculation with *Puccinia polysora* at Muguga, Kenya, have demonstrated the susceptibility of African types and the occurrence of hypersensitivity among introductions from Mexico, Central America, Colombia and the West Indies (cf. *PBA*, XXIV, Abst. 2943). As previously reported, hypersensitivity is controlled by a single dominant gene. Further investigations have suggested the occurrence of a second major gene for hypersensitivity.

Seedling reaction to *P. polysora* is correlated with field response. A new race of the pathogen has been identified (cf. Abst. 405).

In breeding carried out by the Tanganyika Agricultural Corporation, considerable progress has been achieved in transferring the gene for hypersensitivity to *P. polysora* from Colombia 2 to the variety Katumbili; it is expected that resistant bulks will shortly be issued.

Cassava. In breeding carried out at Amani, Tanganyika, for resistance to mosaic and brown streak combined with the capacity to give high yields of palatable roots, the most resistant lines derived from back crosses of ceara x cassava to cassava have been (1) inbred, (2) intercrossed, (3) further back-crossed and (4) crossed with *Manihot dichotoma* x cassava hybrids. Breeding with hybrids of *M. catingae* x cassava and *M. melanobasis* x cassava also continued. Seed set has been poor when ceara x cassava derivatives were selfed or back-crossed to cassava but good upon intercrossing of these lines. Derivatives of *M. melanobasis* x cassava are good producers of seed.

Provided quarantine measures can be accomplished at Eldoret to eliminate any carriers of brown streak, prior to propagation at a more suitable place, e.g. Kakamega, virus-resistant high-yielding clones will be available for distribution and extensive adaptability tests.

Groundnut. Only seedless fruits have been secured from crosses of *A. hypogaea* with $2n$ species. Growth of the embryo apparently ceased after 7 days. Colchicine-induced $4n$ *A. prostrata* failed to cross with the groundnut.

In work by the Tanganyika Agricultural Corporation, selection of Mwitunde for resistance to rosette at Nachingwea has given encouraging results. The lower number of lesions due to *Cercospora* spp. on the stems and petioles of resistant varieties, such as Mwitunde and Kanyoma, is associated with smaller stoma size and thicker tissues.

The National Research Council Review 1955.
Ottawa : Pp. 268.

2076 *Associate Committee on Plant Breeding. (pp. 208–13).*

University of Alberta

Effects of 2,4-D. Further work was carried out on the cytogenetical responses of plants (unspecified) to 2,4-D and other herbicides and insecticides.

Wheat. Cytogenetical analysis by means of nullisomic and monosomic forms continued. Back crossing to secure all monosomic lines of Lemhi and Thatcher was effected; reciprocal substitution has been initiated in most lines.

Sunflower. Early high-yielding inbreds were distinguished by means of seedling measurements of their polycrosses. General combining ability may be satisfactorily tested by polycrossing.

University of Manitoba

Wheat. Substitution of rye chromosomes for chromosomes in winter wheat is in progress. An attempt is still being made to determine the chromosomes on which the genes for growth habit in winter wheat are situated.

Barley. Ring formation is under investigation. Identified marker translocations are being used in identifying unknown translocations.

Grasses. Further investigations were carried out on natural and experimental polyploidy and its practical significance. The cytology and taxonomy of the Triticeae, especially the wheats and their relatives, were studied.

University of Saskatchewan

Induced mutants. Radiation-induced mutants of plants (unspecified) were further studied. Low-energy ionizing radiations are more efficient than high-energy in producing biological effects.

Wheat. An aneuploid series of *Triticum durum* is being developed.

2077 Weibull, G.
Växtförädling och utsädeshandel i Nordamerika. Några intryck sommaren 1955. (**Plant breeding and seed distribution in North America. Some impressions, summer 1955**).
Weibulls ill. Årsb. 1956 : **51** : 12–18.

The main trends of plant breeding in the USA and Canada are surveyed and compared with those in Sweden. In North America the emphasis is on increasing disease resistance, often on the basis of intensive studies of the mode of inheritance of resistance, rather than on increasing yield and quality as in Sweden. Heterosis is much employed and there appears to be some danger of increasing the uniformity of certain crops at the expense of genetic variation. There are few private breeders and these may experience much difficulty in introducing new varieties without official backing.

Abstracts of papers presented at the twenty-second meeting of the Canadian Phytopathological Society.
Proc. Canad. phytopath. Soc. 1955 : No. 23 : 14–22.

2078 *Callbeck, L. C. & Robinson, D. B. Stem streak of potato. (p. 14).*

Of twelve varieties tested at Charlottetown, PEI, for susceptibility to a disorder characterized by brittleness and streaking of the stalks and petioles and chlorosis of the leaves, Green Mountain, Canso and McIntyre showed no symptoms and Warba and Pontiac were only slightly affected. The disease appears to be due to manganese toxicity.

2079 *Campbell, W. P. Infectivity of cereal hosts by ergot from roadside grasses.* (*pp. 14–15*).

No evidence of the occurrence of different pathogenic races of *Claviceps purpurea* in Western Canada was found among 283 isolates from various grasses, tested on rye, wheat, barley, oats, wild oats and *Triticum monococcum.*

2080 *Hrushovetz, S. B. Cytological studies of* Helminthosporium sativum *and its perfect stage* Cochliobolus sativus. (*p. 17*).

The formation of multinucleate conidia is described. The occasional occurrence of abnormal divisional figures in the asci of fewer than eight ascospores and of degenerating ascospores is regarded as indicating a structural difference between the chromosome complements of the two mating types used. The haploid chromosome number is eight.

2081 *Tinline, R. D. Induced mutation in* Helminthosporium sativum. (*pp. 21–22*).

Mutation rate in both wild-type and albino cultures was increased by ultraviolet irradiation of conidial suspensions. Mutants differing from their parents and each other in morphology, degree of sporulation, rate of growth, nutrient requirements and pathogenicity were obtained.

Abstracts of papers accepted for presentation at the forty-seventh annual meeting of the American Phytopathological Society Atlanta, Georgia, December 27, 28, 29, 30, 1955.

Phytopathology 1956 : **46** : 6–33.

2082 *Alexander, L. J. Embryo culture of tomato interspecific hybrids.* (*p. 6*).

A satisfactory medium for the culture of hybrid embryos excised from the fruits of Break O'Day, Sioux and Cobourg 35–45 days after pollination with *Lycopersicon peruvianum* was obtained by adding the following, in mg./l., to White's mineral salt solution: sucrose, 20,000; malt extract, 15,000; glycine, 3·0; ascorbic acid, 20·0; thiamin, 0·15; riboflavin, 0·20; nicotinic acid, 1·0; calcium pantothenate, 1·0; vitamin B_6, 0·2; succinic acid, 25·0; and adenine, 20·0. The medium was solidified with 0·8% agar. Approximately 30% of the pollinated flowers set fruit and of these about 9% contained an average of 2·41 culturable embryos, Cobourg fruits having the highest percentage of embryos.

2083 *Allison, J. L. Stem nematode of perennial forage legumes.* (*p. 6*).

Thirty-one varieties and accessions of lucerne and two red and two white clovers were tested for seedling resistance to *Ditylenchus* spp. All the lucerne varieties were more susceptible than the clovers, the normally resistant lucerne Lahanton and its derivatives showing only moderate resistance to North Carolina stem nematodes.

2084 *Allison, J. L. Root knot of perennial forage legumes.* (*p. 6*).

Among 16 varieties and 5 accessions of lucerne, a few were resistant to each of five *Meloidogyne* species but most were highly susceptible to *M. hapla* and moderately susceptible to the rest. Five accessions of *Lespedeza sericea* were moderately resistant to *M. hapla* but varied considerably in reaction to the other species. Clovers and other legumes tested were susceptible to all five species.

2085 *Anderson, R. V. & Hart, H. Effects of ionizing radiations on the host-parasite relationship of stem rust of wheat.* (*p. 6*).

After X irradiation of the uredospores of race 48 of *Puccinia graminis* var. *tritici* or of the young mycelium in the host following inoculation, the number of uredia produced was inversely proportional to dosage, but no mutants of the rust were obtained. The effects of irradiating uredospores with thermal neutrons were similar. Exposure of seeds of several wheat varieties to thermal neutrons resulted in an increase in sterility and early death, but no changes in reaction to race 48 were detected.

2086 *Ashworth, L. J. & Wilson, E. E. Cultural, morphological, and pathogenic variability of* Hendersonula toruloidea. (*p. 7*).

A few single-spore isolates of *H. toruloidea* produced few or no conidia and large amounts of sterile white mycelium, the cells of which contained 3–23 nuclei. Normal isolates produced abundant spores, over 90% of both vegetative cells and conidia containing one nucleus each and the remainder two. The variant was unable to produce typical cankers on *Juglans regia.*

2087 *Braverman, S. W. Host relationship, morphology, and sporulation of* Scolecotrichum graminis. (*p. 8*).

The pathogenicity of conidia from cocksfoot and timothy tested on these species and on oatgrass was found to be limited to the original host species. No differences in morphology or growth rate were found between isolates from the different hosts.

2088 *Busch, L. V. & Walker, J. C. Resistance to anthracnose in cucumber.* (*p. 8*).

Of some 130 introductions of cucumber tested for reaction to *Colletotrichum lagenarium*, eight showed some resistance. Results from F_1 and back-cross progenies from SMR12 (♀) crossed with accessions 163213, 163217 and 175111 indicated that the inheritance of resistance is of two types, multifactorial and monogenic. The early stages of infection were identical in both resistant and susceptible hosts, but mycelial growth was rapid in susceptible plants and accompanied by collapse of tissues, while in resistant hosts little cell collapse occurred. Apparent thickening of the cell wall in certain areas and deposition of globules of gum-like material frequently accompanied the resistant reaction.

2089 *Diachun, S. & Henson, L. Clones of Kenland red clover as local-lesion hosts for yellow bean mosaic virus.* (*pp. 10–11*).

A number of clones developing necrotic local lesions when rubbed with yellow bean-mosaic virus have been selected from populations of Kenland red clover. Interclonal differences in severity and rapidity of development of necrosis were observed.

2090 *Dickson, J. G., LeRoux, P. M., Syamananda, R. & Flangas, A. L. Progress reports on genetics of pathogenicity of* Puccinia sorghi. (*p. 11*).

Among eight independently inherited dominant factors for resistance isolated from maize of North and South American origin, each of seven governs resistance to one of seven different pathogen races, while the eighth, the Cuzco factor, controls resistance to all isolates tested. Inbreeding of uredial clones of *P. sorghi* and *P. purpurea* on their ecidial host has resulted in the development of uredial clones differing in pathogenicity from the original clones.

2091 *Futrell, M. C. & Pilgrim, A. J. Relative ability of four races of* Puccinia graminis tritici *to overwinter in Texas.* (*p. 12*).

Differences were found in the ability of races 15B, 17, 38 and 56 to overwinter and in their susceptibility to attack by bacterial parasites under conditions of high rainfall and humidity. Less overwintering occurred on wheats of decumbent growth than on those of erect habit.

2092 *Hansing, E. D. Physiologic races of* Ustilago tritici *in Kansas.* (*p. 13*).

On the basis of their reactions on ten differential wheats, 126 collections of *U. tritici* fell into five groups identified as races 1, 3, 6, 10 and 11. Races 3 and 6 occurred only in eastern Kansas while the others were distributed throughout the state. Ponca, Triumph and Vigo were resistant and Pawnee and Kawvale highly resistant to all races. Kiowa, Cheyenne, Royal and the 10 Blackhull strains were highly resistant to races 1 and 10, susceptible to race 11 and variable in reaction to races 3 and 6. Westar and Quanah were highly resistant to race 11 and intermediate in reaction or susceptible to the other races and Wichita, Comanche, Tenmarq, Turkey, Kharkof, Kanred, Nebred and Iobred showed an intermediate or susceptible reaction to all five races.

2093 *Hare, W. W. Some characters identified in cowpeas segregating for resistance to Fusarium wilt.* (*p. 14*).

Among 25 lines originating from a single plant selection the following pod characters appeared to be monogenically determined and were inherited independently of resistance to *Fusarium* wilt: yellow pod colour, dominant over golden and over red; small slender pods, dominant over pods of the Baby Crowder type; and long pods, dominant over pods of the short Crowder type. In two lines, segregation for pod size occurred in the ratio 1 large : 2 intermediate : 1 small. Differences in yield, vine type and maturity were also observed among the lines.

2094 *Hare, W. W. A major gene for resistance to root-knot nematodes in pepper.* (*p. 14*).

All bell peppers tested were susceptible to *Meloidogyne incognita* var. *acrita* while four small-fruited hot peppers were highly resistant. Two pepper varieties were resistant to *M. incognita*, *M. arenaria* and *M. javanica*. Evidence from crosses and back crosses suggested that resistance to *M. incognita* is determined by a single dominant gene and that the same gene controls resistance to *M. incognita* var. *acrita* and possibly to *M. javanica* and *M. arenaria*.

2095 *Hayden, E. B. Differences in infectibility among spring wheat varieties exposed to spore showers of race 15B of* Puccinia graminis *var.* tritici. (*p. 14*).

Intervarietal differences were observed in the numbers of lesions developing on 11 wheats exposed to light and heavy showers of uredial spores, Sentry showing least and Marquis greatest infection.

2096 *Ivanoff, S. S. Reaction to crown rust of Victoria blight resistant oats selected from Victoria-derived commercial varieties.* (*p. 16*).

Selections resistant to *Helminthosporium victoriae* were obtained from oat varieties derived from Victoria. When tested for reaction to *Puccinia coronata*, some selections were highly susceptible at all stages of development and others increased in resistance with age but none equalled the Victoria-blight susceptible parental varieties in rust resistance in spite of similarities in appearance and in reaction to smut and mosaic.

2097 *Johnson, H. W. A head smut resistant strain of rescuegrass from Uruguay.* (*p. 16*).

La Estanzuela 157/49, a strain of *Bromus catharticus* from Uruguay, was immune from five collections of *Ustilago bullata* from Mississippi, Alabama, Georgia and Texas but was moderately susceptible to one from Baton Rouge, La. Four other strains were susceptible to all six collections.

2098 *Kendrick, E. L. & Holton, C. S. Pigmentation of the culture medium as an indicator of sex compatibility factors in* Tilletia caries. (*p. 17*).

Each of five monosporidial lines of races T–10 and T–16 comprised two groups, one producing a rust-brown colour in the agar medium and the other not. The two groups in each line were of opposite compatibility types but pigmentation was not associated with the same compatibility type in the different monosporidial lines.

2099 *Kline, D. M., Boone, D. M. & Keitt, G. W. Experimental control of pathogenicity of biochemical mutants of* Venturia inaequalis. (*p. 17*).

The pathogenicity to apple leaves of eight biochemical mutants was very low compared with that of the wild-type parental line but could be largely or wholly restored in mutants requiring choline, riboflavin, uracil, arginine, methionine or histidine by addition of the required nutrients to the leaf surface after inoculation.

Pathogenicity of mutants requiring adenine or guanidine could not be restored by this means. Sap expressed from apple leaves supported the growth of all except the histidine-requiring mutant.

2100 *Luke, H. H. & Wheeler, H. E. Disease-resistant oat selections obtained from susceptible varieties.* (*pp. 18–19*).

Material resistant to *Helminthosporium victoriae* has been selected from the susceptible varieties Victorgrain 48–93 and Fulgrain, which carry resistance to crown rust, in an attempt to combine resistance to the two diseases. The selections varied widely in reaction to race 202 of crown rust but did not show the typical parental reaction although they resembled the parent varieties in morphological characteristics.

2101 *Nelson, R. R. Transmission of factors for urediospore color in* Puccinia graminis tritici *by means of exchange of nuclei between vegetative hyphae.* (*p. 21*).

Inoculation of Vernal, which is resistant to race 11 of *P. graminis* var. *tritici* and susceptible to race 121, and of Little Club, which is susceptible to both races, with a mixture of the reddish-brown uredospores of race 11 and the greyish-brown uredospores of race 121 led to the production of an unstable orange biotype virulent on both species and dissociating into reddish-brown and greyish-brown forms. When tested on differential varieties, 30 of the latter dissociants were intermediate in pathogenicity between races 11 and 121 and two exceeded both races. About 1% of the uredospores of the orange biotype were trinucleate, while those of the original races, of the dissociants and of the stable orange forms developed after ten uredial generations were binucleate.

2102 *Niederhauser, J. S. & Cervantes, J. Maintenance of field-resistance to* Phytophthora infestans *in potato selections.* (*p. 22*).

From a world collection of 20,000 clones exposed at Toluca, Mexico, to field infection by a *Ph. infestans* population comprising at least 13 races, about 150 commercially acceptable selections showing good field resistance have been made and maintained. In some clones, field resistance was not dependent on the hypersensitive reaction. Clones Ac 25953 and Ac 25949 are valuable parents conferring high levels of field resistance on their progeny.

2103 *Nielsen, L. W. Evaluation of Irish potatoes for resistance to* Pseudomonas solanacearum. (*p. 22*).

In testing a greenhouse method of inoculation for its reliability as an indicator of field resistance, a highly significant correlation was found between the indices of disease in 16 inoculated selections grown in the greenhouse and the percentage of diseased plants of the same selection grown in the field under infected conditions.

2104 *Nielsen, L. W. Evidence of resistance in sweet potato to the internal cork virus.* (*p. 22*).

Of 45 varieties, selections and breeding stocks tested for reaction to internal cork virus, 11, including Nancy Hall, were free from symptoms. Tissues from seven of these and from all those with few symptoms were able to cause symptoms in the most susceptible variety, Porto Rico, but tissues from the symptom-free strains Hm 15, Hm 2, Hm 22 and HC164 were not infective.

2105 *Powers, H. R. (Jun.) & Moseman, J. G. Heterothallism in* Erysiphe graminis tritici. *(p. 23).*

Tests of 20 monospore cultures indicated that *E. graminis* var. *tritici* is heterothallic, at least two distinct compatibility groups being involved. No consistent relationship was observed between compatibility and pathogenicity. Preliminary observations suggest that *E. graminis* var. *hordei* may also be heterothallic.

2106 *Renfro, B. L. & Young, H. C. (Jun.). Techniques for studying varietal response to* Septoria *leaf blotch of wheat. (pp. 23–24).*

Techniques for producing an epidemic of *S. tritici* in the greenhouse and in the field are described. Among 17 winter wheats tested, Red Chief and Nabob were very resistant to all isolates.

2107 *Roberts, D. A. Use of a detached-leaf technique for testing leguminous forage plants for resistance to foliage diseases. (p. 24).*

A method useful for rapid preliminary screening for resistance involves floating detached leaves of the plants to be tested on 2% sucrose solutions inoculated with finely chopped mycelium or spores of the fungus under investigation. Spraying the inoculum on to detached leaves is also satisfactory.

2108 *Sackston, W. E. Forms and races of* Puccinia helianthi. *(p. 25).*

Differences in pathogenicity of rust isolates from different species and varieties of *Helianthus* in Manitoba and Chile are noted.

2109 *Sill, W. H. (Jun.). Use of corn and Agrotricum hybrids for more rapid identification of three grass viruses. (p. 26).*

The reactions of maize seedlings and *Agropyron* x *Triticum* hybrids to wheat streak mosaic varied from immunity to systemic infection; the grass-like hybrids tended to be immune and the wheat-like hybrids susceptible. Barley mosaic virus and barley stripe mosaic both caused severe systemic infection in all the hybrids and maize seedlings.

2110 *Swarup, V., McCracken, E. U., Sill, W. H. (Jun.) & Schmidt, J. W. A cytogenetical analysis of reactions to wheat streak mosaic virus in certain Agrotricum hybrids. (p. 28).*

The F_1 generation of *Agropyron* x *Triticum* hybrids showed local lesions when inoculated while the F_2 and F_3 showed three types of reaction: local lesion (LL), local lesions followed by systemic necrosis (LL/S) and systemic necrosis (S). In the F_2, numbers of chromosomes and univalents were, respectively, 49·5 and 4·82 for LL plants, 45·6 and 3·92 for LL/S plants and 43·6 and 2·72 for S plants, the numbers in LL individuals being significantly higher than those in the other types. The gene or genes determining the local lesion type of reaction lay on one or more chromosomes from the X or Y genomes of the *Agropyron* parent and appeared to be associated with genes controlling grass-like characters.

2111 *Takeshita, R. M. Strains of the yellow-dwarf virus of cereals. (p. 28).*

Differences in virulence have been found among isolates tested on numerous barley, wheat and oat varieties.

2112 *Waggoner, P. E. & Dimond, A. E. Altering disease resistance with ionizing radiation and growth substances. (p. 30).*

A temporary increase in resistance to *Fusarium* wilt was induced in plants of the susceptible tomato variety Bonny Best both by X irradiation of the roots and by spraying with 0·27 mM naphthalene acetic acid. X irradiation of the roots also increased the polygenically determined resistance of Pritchard but X irradiation of the shoots decreased resistance in both varieties. The monogenically controlled resistance of Pan American was unaffected by X irradiation.

2113 *Walter, J. M. Hereditary resistance to tobacco mosaic in tomato. (p. 30).*

Homozygosity for tolerance of a combination of green and yellow strains of tobacco mosaic virus was found in selections from advanced generations of a cross between Rutgers x *Lycopersicon hirsutum* and Indiana Baltimore. Attempts are in progress to transfer the three recessive genes which appear to be involved to larger-fruited tomatoes. The tolerant condition disappears in the presence of other viruses such as *Marmor erodens* and *M. upsilon*.

2114 *Walter, J. M. Combination of resistances to tobacco etch and tobacco mosaic in tomato breeding stocks. (p. 30).*

Selections combining resistance to tobacco mosaic and etch (*Marmor erodens*) have been obtained from a cross between PI 183692, an attractive etch-resistant form of *Lycopersicon esculentum* from Turkey, and the mosaic-resistant stock CStMW18. Preliminary studies indicate that the resistance to etch is in fact immunity and is monogenically determined.

2115 *Watson, I. A. Epidemiology of wheat rusts in Australia. (p. 30).*

The relationship between the introduction of new sources of resistance and the development of new biotypes of *Puccinia graminis* var. *tritici* in Australia is discussed. At least 16 races and biotypes of the fungus can be distinguished through the use of the varieties Webster, Gaza, Spica, Uruguay and Hope.

2116 *Yerkes, W. D. (Jun.) & Freytag, G. F.* Phaseolus coccineus *as a source of root-rot resistance for the common bean. (p. 32).*

The F_1 of a cross between a *Ph. vulgaris* variety of the Canario type and *Ph. coccineus* was self fertile and carried the resistance of the latter parent to root rot.

2117 *Yerkes, W. D. (Jun.) & Ortiz, M. T. Races of* Colletotrichum lindemuthianum *in Mexico. (p. 32).*

Four new groups of races, each comprising several biotypes, have been identified in Mexican collections of *C. lindemuthianum*. Canario beans are the most susceptible to group 6 and the bayo beans to groups 4 and 5; the black beans vary in susceptibility.

2118 **Research, the key to agricultural progress.**
65th Ann. Rep. Univ. Md. agric. Exp. Sta. 1951–1952 : Bull. No. A–74 : Pp. 88.

Barley, lucerne, fruits, potatoes and other vegetables and sweet corn hybrids were tested for adaptation to Maryland conditions and the following crops were studied:—

Wheat. The leaf-rust resistant selection USDA 2381 compared favourably in yield and lodging resistance with some of the best established varieties in tests in various localities in Maryland.

Maize. The hybrids Conn. 870, Conn. 845 and Pa. 602 have been placed on the recommended list for Maryland. Ten inbreds are being evaluated as parents by crossing in all combinations. Tests of double-cross hybrids have been carried out. Haploid twin seedlings developing from single seeds have been observed and may be of use in developing homozygous lines (cf. *Capsicum* below).

Cocksfoot. In varietal tests, Beltsville continued to show superiority in leafiness and freedom from leaf disease and insect attack, but commercial varieties gave higher yields. An experimental strain, Early Synthetic, showed promise. Late-maturing, leafy plants with resistance to leaf diseases have been developed and are being tested for their suitability for combining into synthetic varieties.

Clover. Breeding of red clover for anthracnose resistance is in progress. In Ladino clover, attempts are being made to combine superiority of performance with adaptation to Maryland conditions.

Tobacco. Material resistant to *Fusarium* wilt and *Thielaviopsis basicola* has been developed and breeding for resistance to mosaic, wild fire, black shank and anthracnose is in progress. A number of *Nicotiana* species highly tolerant of anthracnose are being crossed with Maryland.

Capsicum. Thirty homozygous lines obtained through colchicine-induced chromosome doubling of maternal haploid plants derived from twin or multiple seedlings are now being tested for commercial value and used to study hybrid vigour.

Raspberry. A series of crosses involving European, American and Asiatic red-fruited species has given promising plants combining the fruit size and colour of the European type with the resistance to diseases and high temperatures of the Asiatic form. Black raspberries are undergoing selection for adaptation to Maryland conditions.

Strawberry. The selection Md.–US 2159 is resistant to prevalent races of *Phytophthora fragariae*, including the new race attacking the formerly resistant variety Temple, and is also resistant to *Mycosphaerella fragariae*, *Marssonina fragariae* and *Sphaerotheca humuli*.

Asparagus. Chromosome doubling has been induced in Maryland by treatment with colchicine.

Tomato. Seeds producing twin seedlings have been observed in the variety Rutgers and are being studied (cf. maize and *Capsicum* above).

2119 **Annual report of the Florida Agricultural Experiment Station for the fiscal year ending June 30, 1954** : Pp. 326.

Wheat. Promising leaf-rust resistant lines have been developed.

Oats. Stem-rust resistant mutants were obtained from material irradiated with thermal neutrons.

In breeding for crown-rust resistance at the North Florida substation, a combination of genes from diverse sources is being sought. Among parents used in 1954, Ascenção is of particular interest since it has exhibited resistance to the new race attacking most varieties used as sources of resistance to this disease.

Maize. Multiple crosses involving lines of South American origin and hybrids from the corn belt are being tested in breeding for resistance to leaf diseases and other desirable characters.

Barley. Lines resistant to spot blotch, powdery mildew and leaf rust have been bred.

Ryegrass. Over 150 rust-resistant selections were allowed to intercross freely and were harvested in bulk for testing for possible release.

Forage legumes. In breeding yellow lupin, resistance to virus disease is receiving particular attention. A sweet mutant was found among plants derived from irradiated seed of Alta Blue. A chromosome number of $2n = 52$ was tentatively established for *Lupinus hispanicus*.

Several progenies of red clover were highly resistant to powdery mildew.

Cotton. Progress is being made in selection for better opening bolls, less fuzz and other improvements in Sealand.

Hibiscus cannabinus. *Colletotrichum hibisci* has been found to be physiologically specialized. Selections highly resistant to race 1 have been isolated.

Sansevieria. Interspecific hybrids have been studied (cf. *PBA*, XXIV, Abst. 3182).

Sugar cane. Selection of seedlings and hybridization continued at the Everglades substation.

Tobacco. The relationship between nematode resistance and leaf width was investigated (cf. *PBA*, XXV, Abst. 1302). Dixie Shade, showing resistance to root knot and other improvements compared with Rg, was released (cf. Abst. 1574).

Capsicum frutescens. Leaf-roll due to tobacco etch virus was not associated with decreased fruit production; this type of resistance may be useful in breeding. Ornamental types showing no symptoms of this virus are to be used in breeding commercial peppers.

Tung. In an attempt to develop a vigorous, late-blooming variety of tung less liable to injury by late spring frosts than *Aleurites fordii*, hybrids of *A. fordii* x *A. montana* were back crossed as males to the former parent. Seedling progenies of *A. fordii* trees selected for resistance to low temperature before and during flowering are to be tested.

Groundnut. Florispan Runner was released (cf. Abst. 1755).

Grape. Lake Emerald was released (cf. Abst. 1807). New crosses included some with Lake Emerald as ♂ or ♀ parent.

Celery. Promising lines showing resistance to early blight (*Cercospora apii*) have been obtained.

Cantaloupe. Lines showing resistance to both powdery and downy mildew include derivatives of Smith Perfect x Powdery Mildew Resistant 5 and Georgia 47 x Sanford 9.

Water melon. Progress is reported in breeding for combined resistance to *Fusarium* wilt and anthracnose.

Tomato. Manalee, resistant to *Fusarium* wilt, grey leaf spot, early blight and leaf mould, was released (cf. Abst. 1889). Advanced selections from crosses of Manalee with Manalucie and STEP 206 show promise of being superior to their parents in horticultural characters. Selections possessing resistance to tobacco mosaic and fruits with good quality and flavour have been obtained from Manalucie x CStMW18; the latter parent has fruits of unsatisfactory quality. According to preliminary results, selections combining the tobacco-mosaic resistance of CStMW18 with the tobacco-etch resistance of PI183692 have been produced. PI115201 has been used as a source of resistance to *Phoma destructiva*.

Phaseolus. The rust-resistant pole bean Fla. 201–2 is being increased for distribution. Derivatives of *Ph. vulgaris* x *Ph. coccineus*, *Ph. vulgaris* x *Ph. glabellus* and *P. lunatus* x *Ph. polystachyus* are under observation as possible sources of certain desirable characters.

Cowpea. Lines of several different table types are being developed.

Soya bean. Selection D49–2524 has been named Lee (cf. *PBA*, XXV, Abst. 616).

Sweet corn. The inbreds Me2rt and LTB have shown particular promise as parents conferring resistance to *Helminthosporium turcicum*.

2120 **Sixty-seventh annual report of the Tennessee Agricultural Experiment Station 1954** : Pp. 76.

Wheat. Breeding has resulted in some 200 hybrid lines which are to be screened for resistance to leaf rust and other diseases.

Rye. The variety Balbo was treated with colchicine, with a view to hybridization between the $4n$ derivative and Tetra-Petkus.

Hordeum. Local $2n$ barleys were treated with colchicine to induce tetraploidy, prior to crossing with *H. bulbosum*.

Forage legumes. Seeds of various species were exposed to γ radiation. Polyploidization by colchicine treatment is also in progress.

Vetches combining the erectness of existing strains with winter hardiness are to be developed. Common vetch is being subjected to colchicine treatment to produce tetraploids as the basis of an attempt to cross this species and *Coronilla varia*.

Cotton. Plants representing the fourth back cross of trispecific hybrids with selections of *Gossypium hirsutum* crosses continued to give high breaking strengths on the "stelometer."
A lint fraction balance has been devised which enables the breeder to determine lint percentages directly.

Tobacco. Developed at the Tobacco Experiment Station, Greeneville, Burley 11A, Burley 11B and Burley 21 were released (cf. *PBA*, XXIV, Abst. 3215 and XXVI, Abst. 562). Breeding is in progress to develop burley varieties combining resistance to wild fire, mosaic, black shank, *Fusarium* wilt and black root rot. Lines with lower nicotine and total alkaloid contents than commercial varieties grown at present have been isolated.

Pear. Ayres, Mooers, Hoskins and Dabney were released (cf. *PBA*, XXIV, Abst. 3291).

Rubus. In raspberry breeding, success was obtained in crossing with *R. albescens*.

2121 **Dividends from research. Annual Report 1955.**
Bull. N. Dak. agric. Exp. Sta. 1956 : No. 401 : Pp. 40.

Wheat. In trials at Fargo, ND, the early, rust-resistant hard red spring wheats ND 20, 22 and 33 and Ns. 3880.227 gave the highest yields. Four new durum wheats resistant to stem-rust race 15B were increased. Inheritance of resistance to stem rust, starchy-vitreous endosperm, earliness and other characters is being studied.

Oats. The early lines CI5927 and Minland have shown excellent resistance to stem rust.

Maize. Numerous inbred selections are under study and many crosses have been effected. A new 75-day hybrid, CB1210, was released. Selection for ability to germinate under cold conditions is in progress.

Barley. Strains tolerant of the false stripe virus are being used in a crossing programme. A selection with resistance to *Septoria* leaf spot and other leaf-spot diseases is also being used extensively as a parent.

Sudan grass. Piper continued to outyield other varieties. Lines have been developed containing one-seventh as much prussic acid as control varieties and are being crossed with disease-resistant material.

Sweet clover. In an attempt to transfer the factors for low coumarin content from white to yellow sweet clover, hybrid embryos from crosses between the two species have been grown on an artificial culture medium but so far all hybrids have failed to mature. Different media are being tested.

Potato. Several scab-resistant varieties have been obtained, some of which have also shown resistance to blight and immunity from virus X. Promising red and white selections are being increased prior to release.

Onion. New hybrids continued to show superiority over older varieties in yield, earliness and storage characteristics, the hybrids Encore and Abundance being among the best of 36 hybrids and varieties tested.

Tomato. Large-fruited selections with high vitamin C content have been obtained.

2122 Progreso realizado en las investigaciones agrícolas durante el año 1954. (**Progress attained in agricultural research in the year 1954**).
Idia 1955 : Nos. 90, 91 and 92 : 1–192.

Microorganisms. Selection is being carried out in *Aspergillus niger* to increase its capacity to produce citric acid and attempts are being made to produce mutants with higher fermenting capacity by treatment with ultraviolet rays.
Yeasts selected from the vine Malbeck are being selected for resistance to concentrations of alcohol up to 16%.

Wheat. Of all the varieties grown in Argentina the only one that proved completely resistant to loose smut was Sinvalocho; 38 MA was highly resistant and certain others are mentioned as promising; all the forms classed as resistant are derived from Marquis, Reliance, Klein 49a, Chino [Chinese] or a selection from Barleta. A number of introduced varieties and species also proved resistant.
Varieties that have proved resistant to *Erysiphe graminis* var. *tritici* are enumerated; the resistance of *Agropyron* sp. gave complex inheritance in crosses with *Triticum* spp.
The variety 80–3 x Étoile de Choisy [Choisy Star] proved resistant to the three races of *Puccinia graminis* var. *tritici* most prevalent in Argentina. The new Argentine variety Disro I is resistant to all races of *P. graminis* var. *tritici* present (11, 15 and 17) and to some races of *P. triticina* too; a new biotype of race 17 attacks Magnif G. In most varieties resistance to races 15 and 17 is conditioned by different genes, in Egypt NA 95, however, by the same gene. A new wheat Magnif MG, from Magnif G x Mediterranean–Hope–Kawvale–Tenmarq, combines resistance to *P. graminis* var. *tritici* (races 11, 15 and 17), *P. triticina* (races 2, 20B and 492), *P. glumarum* and *Septoria nodorum*.

Magnif Entrerriano is one of the most suitable varieties for the Entre Ríos area and Magnif Guaraní has been approved. At Pergamino hybrid H189 has proved outstanding in rust resistance and yield. Several of the newer hybrids are mentioned as being resistant to race 15B of *P. graminis* var. *tritici* and to races 15 and 20 of *P. rubigo-vera* var. *tritici*. Magnif Entrerriano is also resistant to all these races, with the exception of the last, to which it is practically resistant.

Three races of *S. nodorum* have been identified at Pergamino.

The variety Presidente Perón surpassed all others in yield at Balcarce and has done well also at Rafaela, where a still newer hybrid, 25, from Thatcher x Sinvalocho, is about to be released on account of its resistance to rusts, high yield and quality. At Bordenave the new wheat General Roca MAG shows promise in combining yield, quality and disease resistance. Several hybrids of bread wheats, durum and semidurum wheats are mentioned as promising at Bordenave.

Oats. Races, 3, 7 and 4 of *Puccinia graminis* var. *avenae* continue to be the main races but a biotype capable of attacking Saia has been found within race 3. Derivatives of Hajira are the most promising sources of resistance to race 4 and other races. Sixteen races of *P. coronata* have been found.

At Cañadón León, line 55 was outstanding in yield of grain and forage and free from shedding.

Rye. An F_{10} selfed line, resistant to green aphids (*Schizaphis graminum*) and to rust combined with good yield of grain, has been registered. The new rye Pico MAG has excelled other varieties in yield of both fodder and grain at Pergamino, Balcarce, Manfredi, General Pico and elsewhere and is also possessed of a certain resistance to green aphids.

Maize. It has been found at Pergamino that the single and double crosses with the best standing capacity are often those that are resistant to the various foot-rot fungi, viz. *Helminthosporium* sp., *Sclerotium bataticola*, *Diplodia zeae* and others, and a number of selections have been made on that basis. A collection of 1366 selfed lines arising from plants collected in different parts of the country contains about 0·2% of plants resistant to root rot. Experiments on the use of male-sterile lines in the production of hybrid seed have been initiated. Hybrids such as FAV 355 and Morgan 51, both semidents, the dent hybrids Cargill 300 and La Lucila 503 and the flints Pergamino 2 and Santa Fe 3 have given yields of up to 84 c. per ha., surpassing the open-pollinated varieties by amounts varying from 30 to 60%; the semidents are the best under favourable conditions and are more wind resistant than the flints, which however are more resistant to diseases of the ear and keep better.

Maize varieties collected in the province of Santa Fe produced a greater proportion of recessives in their inbred progenies than those from the Pergamino region. At Tezanos Pinto a study has been made of the F_2 and F_3 segregation of the hybrids obtained by crossing flint x dent parents. Good results have been obtained from a hybrid produced by crossing the variety Manfredi MA with the double-cross hybrid Pergamino 2 MAG. The synthetic Amarga [Bitter] is resistant to locusts and in other respects equal to Cuarentón Klein.

Barley. A collection of 70 barley varieties has been tested for reaction to *Ustilago hordei* and *U. nuda* and those that proved resistant are enumerated. Others have displayed resistance to *Erysiphe graminis*, though the presence of a new race Arg. 3 capable of attacking Chul and Sonora as well as Sturgeon has altered the picture. A gene for resistance to race Arg. 2 found in Palmella Blue has been designated Ml^{z}; it is dominant and independent of Ml^{m}. The gene Ml^{p} in Psaknon is closely linked to Ml^{x} in Nigrate, Chinerme and Arlington Awnless but less so to Ml^{m} in *Hordeum spontaneum*; lines containing both Ml^{p} and Ml^{m} have been obtained and are expected to be resistant to all races of mildew. Some F_6 lines from Atlas x Multan are resistant to mildew and to *Rhynchosporium secalis*. A new gene Ml^{s} for mildew resistance has been found in Sturgeon and it has been shown that Converse possesses the same gene, Ml^{a}, as is found in Axminster and Normandie.

Several varieties are mentioned as being resistant to net blotch and resistance in Rojo [Red] and in *H. spontaneum* proved dominant.

The existence of several biotypes of *Rh. secalis* attacking barley has been demonstrated; some barleys carry genes for resistance to 17 races.

At Balcarce a hybrid of (Primor x Trebi) x Massaux EM has distinguished itself by high yield of both forage and grain, tolerance of treading and resistance to *Rh. secalis*.

In tests at Manfredi the new barley Negra Manfredi [Manfredi Black] has displayed resistance to green aphis and drought, good power of recovery, early development and high yield of forage. The hybrid H24 from a cross of (Primor x Trebi) FCS with Engledow India at Oliveros combines high forage yield, tillering and recovery capacity with resistance to low temperature; some lines of the hybrid are also resistant to two races of *Erysiphe graminis* var. *hordei, Rh. secalis, Helminthosporium teres* and *Puccinia anomala.*

In Patagonia line 17 proved superior to all others in respect of yield of grain, resistance to *Ustilago hordei* and freedom from shedding.

Sorghum. A group of sorghums highly resistant to *Pseudomonas andropogoni* is referred to, others are resistant to *Xanthomonas holcicola* and *Pseudomonas syringae* and others to *Colletotrichum graminicolum.*

A collection of over fifty African sorghums at Manfredi contains a number of lines thought to be of interest for breeding purposes.

Grasses. In the cytogenetics section reference is made to the production of the following hybrids: *Agropyron* sp. x *A. scabrifolium, A.* sp. x *A. scabriglume, A. scabrifolium* x *A. agroelymoides* and *A. scabrifolium* x *Hordeum hexaploidum.*

Ten clones of the fertile amphidiploid *Phalaris tuberosa* x *Ph. arundinacea* have been selected on account of their hybrid vigour. The selection Pergamino PF 179 of *Phalaris minor* has exceeded commercial forms by 20% in forage yield, having a grazing period some 10 days longer and greater uniformity. A selection of *Ph. tuberosa* made at Pergamino is distinguished by 14% greater forage yield, vigour and uniformity.

Two selections of *Bromus catharticus* have been produced at Pergamino, PF172 being distinguished by 50% greater yield of forage and drought resistance, PF195 by rapid early growth and good seed production.

Selections of *Sorghum almum* have exceeded the commercial type by 25% in fodder production. Other selections produce only 30% of short rhizomes and are thus free from the danger of becoming weeds.

At Oliveros two sweet sorghums have been selected, one being 1·60–1·70 m. in height, with large succulent leaves and high yield of high quality fodder, the other being shorter but earlier and more drought resistant but also very succulent and palatable to stock. Two other selections have done well at Rafaela.

A new variety of Sudan grass Oliveros Paraná MAG is described as having yielded 5% more leaf than the common varieties, having a greater power of recovery, being more tolerant of treading and producing fodder that is very palatable to stock. Two selections with low dhurrin content have been obtained at Rafaela. Improved selections of *Dactylis glomerata, Lolium perenne* and other grasses are also mentioned.

Lucerne. Mass selections M1 and M5 and hybrid F have proved outstanding in quality of forage and resistance to stem eelworm (*Anguillulina dipsaci*); M5 has given 23% more yield of forage than the common strains at the J. J. Gómez station in Patagonia. Plants resistant to eelworm have been selected also at Mendoza. Other selections and hybrids are resistant to mosaic (*Medicago* virus 2).

The new variety Pergamino, comprising 35 selected clones, has proved resistant to root rot.

White clover. A form distinguished by greater vigour and aggressivity, good seed production and resistance to cold and drought has been selected at Pergamino.

Potato. At Balcarce, selection P108.49 was distinguished by good keeping capacity, P34.48 by vigour and yield, in which it surpassed Huinkul MA, one of its parents, and P.07 by short dormancy. Material available for breeding includes clones resistant to *Fusarium,* with long dormancy period or with great vigour and late maturity.

Fibre plants. Hybrids between Argentine cottons and various long-stapled cottons introduced from abroad have exceeded the local cottons in yield of long lint.

The best varieties for different parts of the cotton-growing area have been determined and a large collection of cottons from different parts of the world is being maintained. Further improvements have been effected in the varieties Sáenz Peña 61 and Sáenz Peña 85 by continued selection and crosses of Sáenz Peña 85 with wilt-resistant introductions have given rise to hybrids which exceed Sáenz Peña 85 in yield and are resistant to *Fusarium vasinfectum.*

Attempts to cross the cotton Las Breñas 771 with *Gossypium thurberi* have not been successful.

At Las Breñas the selection Las Breñas 341 has shown great promise and from crosses between high-yielding, early local lines with high-quality introductions some promising lines of superior quality have been selected.

At La Banda, the selections J. Brebbia 83 and J. Brebbia 830 have proved outstanding and will replace J. Brebbia 72.

The Argentine flax varieties Calchaquí, Mapún 52, Mocoví and Achay, together with the dual-purpose variety Ranquel, have outyielded all introduced varieties such as Concurrent.

A hemp with 15% of fibre compared with 12% in the standard variety has been selected at Pergamino.

Willow. Meiotic studies in *Salix humboldtiana* have shown the presence of 19 bivalents at metaphase I. Some wild willows from the Paraná delta have $2n = 57$ and are presumed to be hybrids between the local willow with $2n = 38$ and a tetraploid species such as *S. babylonica.*

Seven willow selections are mentioned for their vigour and disease resistance. A large collection of native and introduced willows has been established and selection is being practised in *S. alba* var. *calva.*

Tobacco. Various selections of Kentucky have exceeded the initial strains in yield and uniformity at Cerro Azul, where improvements have also been effected in the Criollo Misionero [Misiones Local] tobacco used for cheap cigars and cigarettes.

Oil plants. The linseed hybrids H684 F5–15 and 16H785–1–2–7–0 were outstanding in yield and other properties at Pergamino. Ranquel MAG proved an excellent dual-purpose variety and selections of it are being made and crossed with rust-resistant varieties.

Two races of *Septoria lini* have been identified but they are very similar in pathogenic properties. No resistant varieties have been found but Entre Ríos is the least susceptible, while among the hybrids H458F–5–39 is less susceptible still. At Oliveros the hybrid Oliveros Toba MAG has matured 5–7 days before Klein 11, the earliest variety so far grown, is immune to all rust races present, resistant to wilt and tolerant of *Septoria lini* and has given yields superior to Charrúa MAG, the variety most resistant to wilt. It surpasses all varieties but Charrúa MAG in oil content; it has a slight tendency to lodge but is recommended for all but the most fertile soils.

In the Entre Ríos province the variety Tezanos Pinto Entrerriano MAG has excelled Querandí MA in yield and resistance to wilt, rust and pasmo and is equal to Charrúa MAG in oil quality; it is highly branched and lodges if planted too densely. It was excelled in wilt resistance by a new selection H496F5–3–3, which in this respect was outstanding.

Some varieties displayed considerable resistance to 2,4-D, others which were more susceptible proved resistant to the sodium salt of MCP.

Sunflower. The work on breeding rust-resistant sunflowers is being carried on in collaboration with research stations in Canada and in Chile, using resistant hybrids from California Oilseed x Texas Wild Annual (cf. Absts. 1636–7) and from Sunrise x Texas Wild Annual.

Seed yields three times that of the standard variety Klein have been attained by the use of single-cross hybrids produced by hand pollination. Seed produced from isolated seed plots contained 5–70% of hybrids and gave yield increases of 70%.

Fruit trees. The mandarin Malvasio MA selected at Concordia produces fruits of excellent quality and appearance, ripening later than other varieties previously available.

Studies have been made on compatibility relationships in varieties of almond, plum, damson and olive.

Improved early-ripening peaches have been produced without sacrificing yield and quality of fruit.

Several direct-producer hybrids have excelled the vine Isabela in preliminary tests at Mendoza.

Groundnut. Mf2 and other selections at Manfredi were less prone to *Cercospora* sp., to various fungi rotting the fruits and to sprouting than the forms commonly grown and had a lesser tendency for soil to adhere to the fruits. The variety Manfredi Colorado [Coloured Manfredi] is a Valencia type suitable for confectionery, with larger seeds than Córdoba, which it has exceeded by 11·6% in yield over a four-year period. A selection of Blanco Manfredi [Manfredi White], a Spanish type, has exceeded the original strain by 9–10% in yield of pods and forage. A selection intermediate in type between the Valencia and the Spanish has exceeded Blanco Manfredi significantly in yield and is to be released.

Vegetables. Three cabbage selections of superior yielding capacity and earlier maturity are being multiplied.

All red peppers were susceptible to bacterial attack with the exception of one selection and the species *Capsicum microcarpum.*

A dwarf selection of French bean from Entre Ríos has proved exceptionally high in yield and quality.

A number of varieties of garden pea have shown resistance to frost. Seven F_7 lines from the crosses Alaska x Holandesa [Dutch], Alaska x Folger and Wyola x Fabriquera [Canning] have been selected on account of their suitability for canning. Selections of table peas have been made from crosses of Ojo Negro [Black Eye] and Cuarentón [Forty-day] with Laxton Progress.

Gourds selected for resistance to mildew are being subjected to further study.

Several tomato hybrids at Manfredi are mentioned for resistance to virus and *Septoria,* good yield and fruit quality.

Inbred generations of onions have been selected for freedom from bolting and other defects and for keeping capacity, with the object of producing synthetic varieties; seed of a synthetic Valencia obtained in this way is already being distributed. Flowering and seed formation in the Great Lakes lettuce have been stimulated by decapitation.

2123 Departement van Landbouw, Veeteelt en Visserij Suriname. Jaarverslag over 1952. (**Annual report of the Department of Agriculture, Animal Husbandry and Fisheries, Surinam, for 1952**) : Pp. 108.

In addition to the crops mentioned below the results of trials of sorghum, groundnut, coffee, cacao, citrus fruits, *Phaseolus vulgaris*, *Pennisetum glaucum* and *Vigna sinensis* are given.

Maize. A number of new varieties and hybrids have been introduced from Java, Cuba and Puerto Rico and are at present undergoing trials.

Rice. Varieties from the USA, Nigeria, Madagascar and Indonesia were compared in trials. Skrivimankoti, Mas and D52/37 were the most productive and the variety Agbede, from Nigeria, showed promise. Makalioka 803 and 823 were adjudged unsuitable for cultivation in Surinam, the former because of its susceptibility to *Helminthosporium* sp. and *Piricularia* sp. and the latter because of its lack of resistance to lodging. Nira, an introduction from Madagascar, was noteworthy for the good quality of its grain but was somewhat susceptible to lodging. Karang Serang, an Indonesian variety, matured in 148 days and was thus earlier than any other variety. Of the American varieties tested, Fortuna gave the highest yields.

Soya bean. The Indonesian varieties Lawoe and No. 27 and the American varieties Acadian and Palmetto gave the best results in trials of recent introductions.

Proceedings of the Seventh Pacific Science Congress of the Pacific Science Association held at Auckland and Christchurch, New Zealand, 2nd February to 4th March, 1949. V. Botany 1953 : Pp. 202.

2124 *Silow, R. A. The problems of Trans-Pacific migration involved in the origin of the cultivated cottons of the New World.* (*pp. 112–18*).

The author presents an account of a survey of the genus *Gossypium* carried out at the Cotton Research Station, Trinidad, and gives an account of the taxonomy and evolution of the genus both in Asia and America. It is suggested that the cottons of the New World, which are of hybrid origin, are partly derived from Asiatic stock and the possibility of one of the parents having been transported from southern Asia to South America across the South Pacific in pre-historic times is mooted (cf. *PBA*, XVIII, p. 183).

Proceedings of the Seventh Pacific Science Congress of the Pacific Science Association held at Auckland and Christchurch, New Zealand, 2nd February to 4th March, 1949. VI. Soil resources, forestry and agriculture. 1953 : Pp. 214.

2125 *Moe, G. Rhizoma alfalfa.* (*pp. 128–30*). Rhizoma (cf. *PBA*, XXII, Abst. 1987) is described. Recent trials conducted by the University of British Columbia have shown that it is resistant to frost and drought and possibly to wilt and crown rot. Its shallow root system gives it an advantage over other varieties on shallow soils.

2126 *Hamilton, D. G. Crown structure and coronal root development as related to lodging in oats.* (*pp. 131–35*).

The results of studies on lodging problems, conducted at the Cereal Division of the Central Experimental Farm, Ottawa, Canada, are reported. Two types of lodging are recognized, viz. that occasioned by a breaking of the culms a few inches above ground level at maturity and that characterized by the uprooting of the plant, due to poor anchorage, prior to maturity. It was shown that varieties differing in resistance to the second type of lodging also differed in the structure of the basal part of the plant and in the size and degree of spread of the coronal root system. It is suggested that more attention be paid to crown and coronal root development in future breeding for resistance to lodging.

2127 *Anderson, J. A. Maintenance of quality in Canadian cereals through laboratory control.* (*pp. 135–39*).

An account is given of the procedure followed in Canada in testing new varieties of crop plants and of regulations, under the Seeds Act and the Canadian Grain Act, to ensure the maintenance of varietal purity.

2128 *Calma, V. C. Agronomic researches on Philippine annual crops.* (*pp. 140–43*).

The results of variety trials of rice, maize, groundnut, sugar cane, lucerne, cowpea and soya bean are presented. The new rice variety Elon-ram, from Elon-elon x Ramai, has proved outstanding. The local sugar-cane varieties PSA7 and PSA14 outyielded POJ2878 in recent trials.

2129 *Amma, M. The breeding of wheat varieties in Japan.* (*pp. 152–53*).

Current breeding aims include earliness and resistance to mosaic, snow mould and rust. Crosses effected between *Triticum vulgare* and *T. durum* have given the two rust-resistant varieties Norin [Ministry of Agriculture and Forestry] 3 and Norin 29. Varieties have been selected for different localities in Japan according to their temperature and day-length requirements. Hard wheats of improved milling and baking quality have been developed.

2130 Se recordó la fundación de la primera estación experimental agrícola de Chile. (**The foundation of the first agricultural experimental station of Chile was celebrated**).
Campesino, Santiago 1955 : **87** : No. 12 : 24–27.

In an outline of the development and work of the station, reference was made to the production of improved forms of the barleys Cruzat and Heines Haisa and of the forage oat Tama.

2131 Bell, G. D. H.
The implication and possibility of organised plant breeding.
Advanc. Sci. 1955 : **12** : 295–300.

The contents of this article have been summarized in Abst. 1090.

2132 **An outline of botanical research on varieties.**
Windmill, The Hague 1955 : No. 18 : 27–28; (also in French, 26–27; German, 28–30; Spanish, p. 30; and Italian, 31–32).

The work of the Institute for Research on Varieties of Crop Plants, Wageningen, is outlined. Under the rules regulating the issue of patent rights to plant breeders in the Netherlands, a new variety has to breed true and be readily distinguishable from all other varieties; the above body is responsible for investigating the morphological and physiological characteristics of all new varieties prior to registration.

2133 Cicin, N. V. & Gorjunov, D. V.
(**Mičurinist theory and practice at the service of the people**).
Dostižen. Nauk. pered. Opyt. seljsk. Hozjaĭstv. (Achiev. Sci. progr. Exp. Agric.) 1955 : No. 10 : 8–19. [Russian].

The Mičurinist basis of plant breeding, with an emphasis on wide crossing and directed training, is expounded and a general description of recent achievements by Soviet plant breeders is given. Reference is made to new good varieties of field crops, industrial and horticultural plants and forest trees. Among the results of work on *Triticum* x *Agropyron* hybrids mention is made of hybrids 599, 186 and 1 (cf. *PBA*, XXIV, Abst. 199). Interspecific hybrids of forest trees bred in recent years include one of *Sequoia gigantea* x *S. sempervirens*. It is thought that this will save *Sequoia* from extinction.

2134 Kupcov, A. I.
(**Changes of wild plants and weeds into cultivated plants**).
Priroda (Nature), Leningrad 1955 : No. 12 : 92–95. [Russian].

This general account of evolutionary changes in wild plants, grown in the field or garden, deals very briefly with such problems as heredity, environment, variability, natural and artificial selection and polyploidy. Instances of cultivated plants that have arisen by doubling or trebling of the chromosome number of their ancestral forms are cited and include the 42-chromosome wheats, 52-chromosome cottons and cultivated varieties of guayule with 72 chromosomes. Reference is also made to the domestic plum, *Brassica juncea* and tobacco, all of which have resulted from interspecific hybridization accompanied by doubling of the chromosome number.

2135 Sen, S.
Chromosome numbers in the family Combretaceae.
Curr. Sci. 1955 : **24** : 422–23.

The following chromosome numbers are reported: *Quisqualis indica*, $n = 13$, *Terminalia arjuna*, *T. bellerica*, *T. chebula* and *T. catappa*, $n = 13$; and *Combretum gloriosum*, $n = 22$.

2136 Baranov, P. A.
Poliploidia in slujba agriculturii sovietice. (**Polyploidy in the service of Soviet agriculture**).
An. Romîno-Soviet. 1955 : **9** : Ser. Biol. : 72–95.

The Russian article on which this paper is based was summarized in *PBA*, XXV, Abst. 177.

2137 Heemstra, J.
The use of vegetative reproduction in the breeding of cross-fertilizing plants.
Euphytica, Wageningen 1955 : **4** : 227–39.

Vegetative propagation has been employed in the Netherlands for over thirty years as a means of maintaining desirable parental lines of the cross-fertilizing crops beet, rye and cabbage for the continued production of F_1 progenies of known characteristics and having greater uniformity than subsequent hybrid generations would have.

2138 Becker, G.
Problematik der Qualitätszüchtung. (**Problems in breeding for quality**).
Dtsch. Landw., Berl. 1955 : **6** : p. 577.

This lecture, presented on the occasion of the second business and scientific meeting of the German Academy of Agricultural Sciences, Berlin, gives a general account of current aims in breeding for improved quality in agricultural and horticultural crop plants. Special emphasis is placed on laboratory methods of testing for quality. It is pointed out that an improvement in quality is often followed by increased susceptibility to diseases and insect pests as, for example, in the case of pea varieties bred for increased sugar content.

2139 Moja, A.
Aspetti genetici della meccanica agraria. (**Genetical aspects of the mechanization of agriculture**).
Sementi elette 1956 : **2** : No. 3 : 16–22.

Reference is made to machines that have been elaborated in the USA and elsewhere for sowing, cultivating and harvesting crops such as maize, potatoes and sugar beet and to the new types of plant produced by geneticists in response to the requirements of these machines; these include shorter maize varieties with ears of uniform height, sugar beets with monogerm seed-balls and short, compact roots, and potatoes with short stolons and haulms that dry off before lifting time.

2140 Zimmermann, K. F.
Mechanisierung des Versuchswesens und der Pflanzenzüchtung. (**Mechanization of experimentation and plant breeding**).
Dtsch. Landw., Berl. 1955 : **6** : 599–603.

The need for increased mechanization in all forms of work connected with variety testing is stressed and a number of machines developed in East Germany to reduce the amount of manual labour involved in the sowing and harvesting of trial plots are described.

2141 Granhall, I.
Gener och gifter till trädgårdsväxternas skydd. (**Genes and toxins for the protection of horticultural plants**).
Sverig. pomol. Fören. Årsskr. 1955 : 95–106.

Breeding for resistance to diseases and pests in various crops is surveyed briefly, mention being made of the use of wild resistant material or radiation-induced resistant mutants in transferring factors for resistance to cultivated plants. The desirability of using both breeding and chemical methods for crop protection is stressed.

2142 Lewis, D.
The genetical approach to plant breeding.
Advanc. Sci. 1955 : **12** : 291–95.

A report of this paper was presented in Abst. 1090.

CEREALS

2143 **Cereal news from Canada.**
Cereal News 1955 : **2** : No. **4** : 6–23.

Wheat. The durum strain DT136 is susceptible to race **11** of stem rust and DT137 is segregating for resistance; both strains have given good agronomic performance at Winnipeg and are resistant to stem rust 15B.

Oats. In Ontario, two strains from (Roxton x RL1276) x (Ajax x RL1276) have been superior to Ajax in yield, earliness, grain size and rust resistance.

Barley. The line 4675–1 (Montcalm x Mianwali) is resistant to jointworm and has given high yields at Charlottetown. Hudson (cf. *PBA*, XXIV, Abst. 330) has been licensed. The F_2 and F_3 progenies of *Hordeum leporinum* x *H. vulgare* and back crosses to *H. vulgare* are being studied. At Winnipeg, several hybrids having Feebai or Wisc. H1061 in their parentage have shown some resistance to one or more leaf diseases, and four selections from Brandon have shown good combined resistance to net blotch and *Septoria* leaf blotch. Family 45 from (Vantage x Jet) x Vantmore is highly resistant to loose smut and some of its lines resemble Vantmore in stem-rust resistance and in general appearance.

2144 **Three new grain varieties.**
Seed World 1956 : **78** : No. 2 : 34–35.

The oats Beedee and Fayette and the barley Fox, developed at Wisconsin University, are briefly described.

Beedee has plumper kernels than other varieties, resistance to *Helminthosporium* blight and smut, moderate resistance to races 7 and 7A of stem rust and a higher degree of leaf-rust resistance than Sauk and Branch. It is midseason to early in maturity. Beacon, Hawkeye and Victoria entered into its parentage.

The short-strawed oat Fayette is chiefly valuable for its early maturity. Bred from Vicland, Branch, Clinton and Santa Fe, it resists leaf rust, smut, *Helminthosporium* blight and race 7 of stem rust.

Fox has stiffer straw than Kindred, ripening slightly later than this variety. Smooth-awned and possessing light blue aleurone, it has outyielded Moore. Its parents were Pedigree 38, Pillsbury and a USDA selection.

2145 McCulloch, R. N.
The agricultural year at Roseworthy college.
J. Agric. S. Aust. 1956 : **59** : 229–36, 243.

Wheat. In trials during 1954 the midseason group of varieties was headed by RAC20 (Gabo x Dundee x Caliph) and Sabre, both developed at the college. RAC20, shortly to be released, has given the best performance in the drier localities of South Australia. It produces medium to strong flour and possesses the Gabo type of resistance to rust. RAC302 (Javelin 48 x Insignia) and RAC246 [(Javelin x Dirk) x (Dundee x Ghurka) x Javelin 48] also showed promise.

Oats. Two selections of Orient x (Mulga x Belar) approached Fulghum as grazing oats and proved superior to this variety in straw strength and grain retention.

Barley. Breeding to develop a variety equal to Prior in malting quality but with better strength of straw is under way. B49–1–5 [Prior x M92 (selection of Olli)] gave the highest yield in the 1954 variety trial.

2146 Konstantinov, P. N.
(The need for further improvements in breeding and varietal testing of barley and oats in the Nonchernozem Belt).
Izv. Timirjazev. seljskohozjaĭstv. Akad. 1955 : No. 1 : 53–68. [Russian].

Mention is made of a new oat variety and three varieties of barley all from the Timirjazev Academy breeding station. They are more productive than Dippe and Viner, the oat and barley standards respectively of the Moscow province. Nutans 226, one of the above barley varieties, shows a good measure of resistance to covered and loose smut and is less susceptible to *Helminthosporium* than Viner.

2147 Jurjev, V. Ja. & Kučumov, P. V.
(Utilizing Mičurinist ideas in the breeding of field crops).
Dokl. Akad. Nauk SSR (Proc. Acad. Sci. USSR) 1955 : No. 5 : 17–24. [Russian].

This article dealing mainly with Mičurinist methods mentions recent breeding research on cereals at the Harjkov and Krasnodar breeding stations. At Harjkov the new high-yielding winter wheats Zenitka [Zenith] and Lutescens 238 have been obtained by continued selection of Hostianum 237 and Lutescens 17 respectively and the yields of the winter wheat Lutescens 266 and the rye Harjkov 194 have been improved by intravarietal pollination involving plants that have been previously grown in different environments. At Krasnodar the winter wheat Line 328/2 has been selected from Stavropoljka 328 [Stavropolj 328] and the winter wheat Krasnodarka 622 [Krasnodar 622] from N 622. The new varieties outyield the old ones by a good margin. A section dealing with wide crossing mentions some fine wheat varieties bred in recent years in the USSR including two selections from Krasnodar, Novoukrainka 83 (Ukrainka x Marquis) and Skorospelka L1 and Skorospelka L3 (both from Kanred-Fulcaster 266287 x Klein 33). Reference is made to the following distant hybrids of cereals bred at various Soviet institutes: hybrids of cultivated and of wild perennial rye with wheat, *Agropyron*-wheat and rye-*Agropyron* hybrids, hybrids of wheat with *Aegilops* and *Elymus*, of barley and *Elymus*, sorghum with Johnson grass and Sudan grass, cultivated oat with wild Mediterranean oat, hybrids of *Elymus* and *Agropyron* and every possible interspecific combination in wheats, barleys and rices. An account is given of experiments at Harjkov on shifting the dominance of characters in the hybrids of ♀ *T. durum* x ♂ *T. dicoccum* by altered environment. The F_1 grown on rich soil gave 80·2% of *T. durum* types, while on poor soil a high percentage of the plants possessed the characteristics of *T. dicoccum*. The incidence of brittle ear characteristic of the ♂ parent was greatly reduced by growing the hybrids on rich soil.

2148 Cicin, N. V.
(Mičurin and his theory).
Vestn. Akad. Nauk SSSR (Rec. Acad. Sci. USSR) 1955 : No. 10 : 3–15; 1955 : No. 11 : 21–30. [Russian].

The first section deals mainly with the Mičurinist theory on the development of new forms of plants. The second report gives an abridged account of the writer's own research on distant hybridization in cereals and on vegetative-sexual hybridization between herbaceous and woody plants (cf. *PBA*, XXVI, Absts. 274–294 and XXIII, Abst. 3076).

2149 Petrov, I. A.
(Vegetative hybridization of cereal crops).
Vestn. Akad. Nauk SSSR (Rec. Acad. Sci. USSR) 1955 : **25** : No. 12 : 21–28. [Russian].

This report on wide vegetative hybridization at the Karelo-Finnish Biological Institute refers to many new forms of wheat, rye, barley and other plants obtained by transferring the endosperm of one plant to the grain of another by injection. The method involved the use of a specially designed drill-shaped glass needle. Some new forms with good economic characteristics, notably the barley 830 (Viner barley + endosperm of *Triticum turgidum*) and 1009 (Viner + endosperm of *T. vulgare*), have been selected. Variety 830 is a two-rowed large-grained naked barley, distinguished by greater earliness than Viner and improved resistance to lodging and diseases. Variety 1009 is a six-rowed hulled barley with similar characteristics to 830. In most cases the selections continued to segregate. The modes of segregation of Viner + endosperm of Diamant [Diamond] spring wheat, Viner + endosperm of Osmo oats, and of an unspecified six-rowed hulled barley + endosperm of Zolotoĭ Doždj [Golden Rain] oats are described. Similar accounts are given of work on wheat and rye. Mention is made of a new awnless spring wheat 223, obtained by injecting the endosperm of Zolotoĭ Doždj oats into the grain of an unspecified awned spring wheat. The spring wheat Severnaja [Northern] has been changed into a winter wheat by injections of endosperms of winter varieties such as Durable and Mestnaja Karelo-Finskaja [Local Karelo-Finnish]. Spring wheats have been obtained from many winter wheats by the reverse operation. The work on rye involved the variety Vjatka and the endosperms of *T. turgidum* and of some varieties of barley and oats. Among the products were new forms of rye that produce branched ears when grown as spring cereals and also some forms characterized by mauve grain. The latter resulted from injecting Vjatka with endosperm from unspecified dark-grained varieties of oat and barley.

2150 Dolgušin, D. A.
(Development and utilization of Mičurinist principles in breeding domestic plants).
Dostižen. Nauk. pered. Opyt. seljsk. Hozjaĭstv. (Achiev. Sci. progr. Exp. Agric.) 1955 : No. 10 : 20–25. [Russian].

This general account of breeding work on cereals at Odessa deals mainly with the Mičurinist methods employed. Intravarietal pollination involving plants that had been previously grown in different environments, intervarietal open pollination, the use of pollen mixtures, interspecific crossing, training spring varieties for the winter habit and winter forms for the spring habit have all been found effective. Mention is made of new high-yielding varieties of wheat, buckwheat, rye, maize and barley. The new spring wheats include Odessa 16, distinguished by winter hardiness, tolerance of variable temperatures in spring, resistance to lodging and high quality grain. Spring and winter forms with branched ears have been obtained by crossing *Triticum turgidum* with *T. vulgare*, both parents having normal ears; spring forms with branched ears have been produced by directed training of pure varieties and hybrids of *T. vulgare*. Lastly, hard winter wheats have been developed by training hybrids of *T. durum* x *T. vulgare* for the winter habit.

2151 Fujiyoshi, M.
(On growth, yield and their interrelations in wheat and naked barley as affected by degree of adaptation to winter sowing and sowing date. Fundamental studies on sowing date in cereals).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1953 : **1** : 375–406. [Japanese].

Data are provided on the effect of different sowing dates, at monthly intervals from October to May, on the number of ears, number of grains per ear and 1000-grain weight of representative winter, intermediate and spring wheat and naked-barley varieties.

2152 Buşilă, A. P.
Contribuţii la studiul tehnicii altoirii cerealelor prin metoda transplantării embrionilor pe endosperm străin 1952–1953. **(Contributions to the study of the technique of grafting cereals by the method of transplanting the embryos on to a foreign endosperm 1952-53).**
Bul. Şti. Secţ. Şti. Biol. Agron. Geol. Geogr. 1954 : **6** : 109–34.

Full technical details are given for grafting wheat embryos on to barley endosperms and *vice versa*. Wheat embryos should be excised 20–21 hr. after germination (humidity of grain 31–32%) and barley embryos after 18–19 hr. (35–36% humidity). After grafting, the grains are tied up in a gauze bag.

Sitzungsbericht über die Tagung der Gruppe Brandkrankheiten der Arbeitsgemeinschaft für Krankheitsbekämpfung und Resistenzzüchtung bei Getreide und Hülsenfrüchten in Frankfurt a. M. am 22. September 1955. (**Report on the session of the meeting of the Smut Diseases Group of the Working Committee for Combating Diseases and Breeding for Resistance in Cereals and Leguminous Crops at Frankfurt am Main on 22 September 1955**).
Z. PflBau. 1955 : **6** : 193–248.

2153 *Schuhmann, G. Weitere Beobachtungen über den Einfluss von Umweltbedingungen auf die Wirkung von Beizmitteln bei der Steinbrandbekämpfung. (Further observations on the influence of external conditions on the efficacy of fungicides in combating bunt). (pp. 194–204).*

Mention is made of differences in resistance to fungicides exhibited by strains of *Tilletia tritici* of various provenance. It is pointed out that such differences are often masked by the effect of environmental factors such as temperature and the composition and moisture content of the soil.

2154 *Lein, A. Resistenzzüchtung gegen Flugbrand bei Sommer-Gerste. (Breeding for resistance to loose smut in spring barley). (pp. 243–47).*

Progress achieved in Germany since 1920 in breeding for resistance to *Ustilago nuda* is reviewed briefly; this pathogen does not constitute a serious problem in Germany and consequently breeding for resistance to it has been somewhat neglected. At Schnega, near Hanover, the resistant Himalayan variety Nepal and a resistant Japanese barley referred to as Miki Hadaka [Miki Naked] were crossed with susceptible local varieties, including Pirol. Resistance was dominant over susceptibility and appeared to depend upon a single gene. By back crossing the hybrids to the European varieties it was found possible to combine the resistance of the Asiatic varieties with the productivity, good grain characteristics and other desirable features of the European barleys.

2155 CONNIN, R. V.
The host range of the wheat curl mite, vector of wheat streak-mosaic.
J. econ. Ent. 1956 : **49** : 1–4.

All the varieties of wheat, barley, maize, sorghum and Sudan grass tested proved to be favourable hosts for the wheat curl mite (*Aceria tulipae*). Wheat streak-mosaic was transmitted by the mite from wheat to all of the wheat and oat varieties and to most of the barleys.

2156 DAHMS, R. G., JOHNSTON, T. H., SCHLEHUBER, A. M. & WOOD, E. A. (JUN.)
Reaction of small-grain varieties and hybrids to greenbug attack.
Tech. Bull. Okla. agric. Exp. Sta. 1955 : No. T–55 : Pp. 61.

Varieties and hybrid selections of wheat, oats, rye and barley were tested for their reaction to the aphid *Toxoptera graminum* in the greenhouse, insectary and field at the Oklahoma Agricultural Experiment Station. The material studied included several *Triticum* species and intergeneric combinations. None of the wheats, oats and ryes showed a high degree of resistance, but several wheats, particularly *T. durum* representatives, were much more tolerant than varieties now grown in the hard winter wheat region, and an offtype extracted from the *T. durum* variety Dickinson 485 (CI3707) exhibited considerable resistance in the insectary. Many barleys were highly resistant. With the exception of Dicktoo and Kearney, these originated in China, Korea or Japan. Data on four crosses involving the susceptible barleys Ward and Tenkow and the resistant varieties Omugi [Barley], Dobaku and CI5087 suggested that resistance was dominant and dependent on two or more genes. No correlations of aphid reaction with morphological characters were detected.

WHEAT

2157 FAJERSSON, F.
Weibulls Atson spring wheat, a new variety for Great Britain.
Agri hort. genet., Landskrona 1955 : **13** : 198–206.

Data on the yield, strength of straw, earliness, resistance to diseases and quality of Atson, bred at Weibullsholm, Sweden, are presented (cf. *PBA*, XXV, Abst. 1794).

2158 CSUKLY, J.
Az őszi búza termésének mennyiségi elemzése. (**Quantitative analysis of winter wheat yield**).
Növénytermelés 1954 : **3** : 77–102.

From the results of field trials conducted at the Mosonmagyaróvár Agricultural Experimental Institute, Hungary, it is concluded that, for machine-sown crops, the numbers of ears per stand and grains per ear have a greater influence on yield than number of tillers (cf. Abst. 2220).

2159 WÅLSTEDT, I.
Svalöfs Drottvårvete. (**The Svalöf spring wheat Drott**).
Allmänna Svenska Utsädesaktiebolaget, Svalöf 1956 : 16–20.

In trials conducted at Swedish stations during the period 1947–54 Drott [King] did well in northern and eastern Sweden but generally gave lower yields than Kärn II [Kernel II] and Svenno in southern areas (cf. Abst. 1129).

2160 MILLER, J. G. & MOUNTIER, N. S.
The border row effect in wheat trials with different spacings between plots.
NZ J. Sci. Tech. 1955 : Sect. A : **37** : 287–99.

Trials of two wheat varieties in which the spacing between plots varied from 7 to 28″ are described. Plot yields rose with wider interplot spacing when the border rows were harvested but the yields of the inner rows were not affected. No clear evidence of intervarietal competitive effects were obtained. The coefficient of variation is increased when border rows are harvested unless the drilling is extremely accurate.

2161 TRENTIN, A.
Sperimentazione sul grano 1954–55 dell'Istituto di Genetica di Lonigo. (**Experiments on wheat in 1954-55 by the Genetics Institute at Lonigo**).
Agricoltura d. Venezie 1956 : **10** : 23–30.

The results of a further year's observation (cf. *PBA*, XXV, Abst. 1834) show that, in spite of very different weather conditions in 1955, Funo, S. Pastore and Mara were still the best among the older varieties. Among the newer varieties S6 (Produttore [Yielder]), Stirpe 1494 [Strain 1494], Leonardo and Leone [Lion] were outstanding whereas Generoso [Generous], Forlani, S. Martino and Titano [Titan] were rather less promising.

2162 TRENTIN, A.
Leone e Leonardo, nuovi grani dell'Istituto di Lonigo. (**Leone and Leonardo, new wheats from the Lonigo institute**).
Sementi elette 1955 : **1** : No. 2 : 50–54.

Both the wheats described are resistant to frost, rusts and lodging, early in maturity and have well-filled ears; both are winter bread wheats giving high yields on fertile soils, Leone (S. Pastore x Funo) having yielded 61·81 c. per ha. in the Po valley in 1955 and Leonardo [Baudi x (S. Pastore x Damiano)] 53·01 c., compared with 49·80 c. from S. Pastore. Leone is further distinguished by freedom from shedding.

2163 Nuovi frumenti. (**New wheats**).
Sementi elette 1956 : **2** : No. **3** : p. 55.

Brief descriptions are given of two new Italian wheats, Generoso (cf. *PBA*, XXV, Abst. 932) and Vivenza clavatino, the latter being an early-maturing winter wheat suitable for growing on high ground in central and southern Italy.

2164 VASILENKO, I.
(**Variety, an important means of increasing productiveness**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 1 : p. 22. [Russian].

Mention is made of a new high-yielding variety of winter wheat, Belaja Cerkovj 198. In the Čerkassy province it outyields the standard Lutescens 17 by 8·7 c. per ha.

2165 MUSTAFAEV, I. D.
(**Breeding new varieties and studying the mode of origin of wheat forms and species in Azerbaĭdžan**).
Agrobiologija (Agrobiology) 1955 : No. 6 : 31–44. [Russian].

This account of breeding work on wheats in Azerbaĭdžan mentions finds of charred grains of wheat and barley from a Stone Age excavation near Nahičevan.

Descriptions are given of Sevindž [Delight], Zogal Bugda [Cornelian cherry wheat], Džafari, Mingečaur, Kyzyl Bugda [Golden wheat] and a number of other varieties of wheat bred in recent years at Kirovabad, all more productive than the standard Arandany. Most of them are hard wheats characterized by resistance to drought and diseases. Breeding work on local forms of *Triticum turgidum* is mentioned. This involves hybridization with *T. vulgare* and *T. durum*, including the new varieties referred to above. The problems of variability and interspecific conversion are discussed in relation to climatic and soil conditions and agricultural methods such as late sowing.

Reported instances of conversions include changes of the botanical varieties *apulicum*, *hordeiforme* and *leucurum* of *T. durum* into varieties *barbarossa*, *ferrugineum* and *erythrospermum* of *T. vulgare* respectively, of *T. turgidum* into *T. vulgare* and of an *erythrospermum* form of soft wheat, resulting itself from a conversion of *T. turgidum*, into *Aegilops*. The occurrence of rye in wheat fields in some districts of Azerbaĭdžan is also attributed to conversion. It is mentioned incidentally that most wheats in Azerbaĭdžan are susceptible to ergot, a disease normally associated with rye.

2166 FAJERSSON, F.
Weibulls Original Svennovårvete. (**The original Weibull spring wheat Svenno**).
Agri. hort. genet., Landskrona 1955 : **13** : 1–18.

A detailed description is given of Svenno, an early, stiff-strawed and high-yielding spring wheat that appeared on the Swedish market in 1954 (cf. *PBA*, XXIV, Abst. 194 and XXV, Absts. 1835–7).

2167 PRIADCENCU, A. *ET AL.*
Cele mai bune soiuri de grîu de primăvară pentru Republica Populară Romînă. (**The best varieties of spring wheat for the Rumanian People's Republic**).
Bul. Şti. Secţ. Şti. Biol. Agron. Geol. Geogr. 1954 : **6** : 51–108.

The results of varietal trials carried out in the regions of Cluj, Stalin, Iaşi, Bucureşti and Constanţa in 1949–52 are reported. The varieties tested were mainly Rumanian, Russian and American. Extensive details are given on their origin, botanical and agronomic characteristics, resistance to diseases and drought, yield and baking quality. The best varieties for the most favourable wheat-growing localities were Marquis bread wheat and Nemerča Arnautka and Melanopus 69 durum wheats. For less favourable areas, the bread wheats Academia RPR 48, (a selection from a local Iaşi wheat), Lutescens 62 and ICAR142 (a selection of Ulca) are recommended.

2168 PRIADCENCU, A.
Étude du comportement de certaines variétés Soviétiques de blé de printemps dans la région de Bucarest. (**Study of the behaviour of certain Soviet spring wheat varieties in the region of Bucureşti**).
Rev. Biol., Bucureşti 1954 : **2** : 14–33.

Seven wheat-*Agropyron* hybrids bred by Cicin and the wheat varieties Sarrubra and Velutinum 15, all from the USSR, were investigated. Data are given on morphology, vegetative period, resistance to heat, drought, lodging and diseases, grain and straw yield and baking quality. Sarrubra and hybrids 3108 and 23311 appear sufficiently well-adapted to Rumanian conditions to merit further trial. Hybrid 22850, although insufficiently resistant to summer heat, has very good baking quality and is recommended for breeding.

2169 (**Achievements in breeding new cereal varieties**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1951 : **1** : 17–19. [Japanese].

This short historical account of wheat and barley breeding in Kyushu includes a synopsis listing the qualities and origins of wheat varieties bred in the island in recent years.

2170 PETERSON, R. F.
International co-operation in wheat breeding.
Agric. Inst. Rev. 1956 : **11** : 16–17, 45.

The cooperative organization of wheat breeding and research in Canada and its coordination with that in other countries, notably the USA and Mexico, are surveyed. The importance of the International Rust Nursery in facilitating tests and exchanges of rust-resistant material is stressed.

2171 FAVERO, A.
Rassegna di nuovi frumenti. (**Review of new wheats**).
Sementi elette 1955 : **1** : No. 2 : 69–70.

Reference is made to the first Italian meeting on new wheats held at Vicenza in September 1955 and to the new varieties exhibited there, which included those referred to in Absts. 1127, 2162 and 2216.

2172 GORIN, A. P.
(**Natural hybridization among wheats**).
Izv. Timirjazev. seljskohozjaĭstv. Akad. (News Timirjazev agric. Acad.) 1955 : No. 2 : 3–18. [Russian].

In Moscow the percentages of natural hybrids produced by a collection of varieties over a number of years have been analysed in relation to the origin of the seed parent. It was found that varieties originating from Central Asia or Canada gave most hybrids and those from northern Russia the fewest. Varieties from the steppe districts of the USSR were intermediate. The highest percentage of natural hybrids was for Marquis, in 1940; it amounted to 2·7%. The average percentage of hybrids for all experimental material for the whole period was 0·19%. It is concluded that natural hybridization, sometimes promoted by the male sterility of interspecific and intergeneric hybrids, is so widespread as to be important in all breeding work on wheats.

2173 Ryžeĭ, I. P.
(The effect of pollinator varieties upon the yield of a maternal variety of winter wheat).
Agrobiologija (Agrobiology) 1955 : No. 6 : 85–88. [Russian].

At Frunze, the winter standard Erythrospermum 72 was crossed with a number of other wheats pertaining to botanical varieties *erythrospermum*, *nigriaristatum*, *pseudohostianum*, *ferrugineum* and *lutescens*. Data showing the yields of the hybrids in the F_2, F_3 and F_4, together with other economic characteristics, are presented. The most promising hybrids were all derived from crosses involving var. *erythrospermum* as the ♂ parent. Among these hybrids, Erythrospermum 72 x Erythrospermum 129 showed the greatest improvement in yield and hybrid Erythrospermum 72 x Erythrospermum 115 surpassed both parents in baking quality and degree of resistance to rust and bunt.

2174 Vogel, O. A., Craddock, J. C. (Jun.), Muir, C. E., Everson, E. H. & Rohde, C. R.
Semidwarf growth habit in winter wheat improvement for the Pacific northwest.
Agron. J. 1956 : **48** : 76–78.

Tests were carried out on the following wheats in Washington and Oregon during 1953 and 1954: the semidwarf Japanese introduction Norin [Ministry of Agriculture and Forestry] 10; the short-strawed variety Elmar; Brevor, with very short straw; and the semidwarf selections 1, 4, 10, 14 and 17 from Norin 10 x Brevor. Like Norin 10, selections 1, 4 and 10 tend to be highly male-sterile. Selections 14 and 17 are reselections for more normal flowering habit. In most of the trials, all five semidwarf selections gave significantly higher yields of grain and lower yields of straw than Brevor and Elmar, and were on the average approximately two-thirds as tall as Brevor. Using the straw-grain ratio as the criterion of efficiency of grain production, selections 14 and 17 gave the best performance. With respect to average protein content of the grain, these two selections were only slightly inferior to Brevor and Elmar.

2175 Harris, R. H. & Sibbitt, L. D.
Relations between wheat protein content, loaf volume, expansion volume, and sedimentation value. I. Plant breeders' samples.
Cereal Chem. 1956 : **33** : 74–78.

Correlations of loaf volume with protein content, expansion volume and sedimentation value in 50 wheat hybrids grown in Mexico and 55 hard red spring wheats grown in North Dakota indicate that the determination of expansion volume and sedimentation value may be of use in screening hybrids for baking quality.

2176 Tanaka, M.
Chromosome pairing in hybrids between *Aegilops sharonensis* and some species of *Aegilops* and *Triticum*.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 7–8.

Crosses of *Ae. sharonensis* with *Ae. bicornis*, *Ae. caudata*, *T. turgidum* and *T. monococcum* showed the following configurations respectively: $0–2_{I} + 6–7_{II}$; $2–10_{I} + 2–5_{II} + 2_{III}$; $0–21_{I} + 0–4_{II}$; and $6–12_{I} + 1–4_{II}$. The first-mentioned cross had 61·9% seed fertility; the remainder of these combinations were completely sterile. In *Ae. sharonensis* x *Ae. longissima* and the reciprocal, $0–1_{I} + 5_{II} + 1_{III}$ or 1_{IV} were observed, with approximately 81% seed fertility. *Ae. sharonensis* x *Ae. aucheri* formed $0–6_{I} + 4–7_{II}$, the reciprocal $0–8_{I} + 3–7_{II}$. In either direction this cross was seed sterile. The bearing of these results upon genome homologies in *Aegilops* and *Triticum* is briefly discussed.

2177 Rajháthy, T.
Búza fajhibridek genetikai vizsgálata. **(Genetical research on wheat hybrids).**
Magyar tud. Akad. Agrártud. Oszt. Közl. 1955 : **6** : 57–84.

Full descriptions are given of the morphology and fertility of F_1 and F_2 hybrids involving *Triticum aestivum* x *T. turgidum*, *T. aestivum* x *T. timopheevi* and *T. turgidum* x *T. spelta*.

2178 Rajháthy, T.
(Genetical investigations of interspecific wheat hybrids).
Acta agron. 1954 : **4** : 203–37. [Russian].

The hybrids *Triticum aestivum* x *T. turgidum*, *T. aestivum* x *T. timopheevi*, *T. turgidum* x *T. spelta*, *T. dicoccum* x *T. monococcum* and others have been produced at Martonvásár, Hungary. Percentage fertilization was higher where the ♀ parent had a low chromosome number while germinating capacity was greater in grain from ♀ parents with a high number. Better grains were obtained when the F_1 of *T. aestivum* x *T. turgidum* was back-crossed to *T. aestivum* ♀ or *T. turgidum* ♂ than in the reciprocal back crosses. The F_1 hybrids were characterized by marked heterosis, particularly in height and length of head, and by low fertility, which increased however in subsequent generations. Although branched heads appeared to be a simple recessive character in a cross between *T. turgidum* (♀) with branched heads and *T. aestivum* (♂), only 2–3% of the F_2 progeny of the reciprocal cross had branched heads. Strains with extremely stiff straw and others yielding flour of good quality were selected from the morphologically highly variable F_2 populations.

2179 WATANABE, Y. & MUKADE, K.
(Meiosis in F_1 hybrids between 5 common-wheat species and *Triticum Timopheevi*).
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 24–33. [Japanese].

Cytological analyses were made of F_1 hybrids between *T. vulgare*, *T. compactum*, *T. spelta*, *T. sphaerococcum* and *T. macha* on the one hand and *T. timopheevi* on the other. Modal meiotic configurations for each cross respectively were as follows: (1) $1_{III} + 9_{II} + 14_{I}$, (2) $1_{III} + 8_{II} + 12_{I}$, (3) $1_{III} + 10_{II} + 13_{I}$, (4) $9_{II} + 13_{I}$, and (5) $1_{III} + 10_{II} + 9_{I}$. Many of the bivalents showed open pairing. All the hybrids were self sterile except *T. spelta* x *T. timopheevi* which was *ca.* 1% fertile. All hybrids gave seed on back crossing.

2180 MATSUMURA, S.
Chromosome analysis of the dinkel genome in the offspring of a pentaploid wheat hybrid. V. Gigas-plants in the offspring of nullisomic dwarfs and analysis of their additional chromosome pair.
Cytologia, Tokyo 1954 : **19** : 273–85.

Dwarf plants ($2n = 40$) with one pair of D chromosomes missing occasionally appeared in the progeny of *Triticum polonicum* x *T. spelta* (cf. *PBA*, XXIII, Abst. 1053). As previously reported, this series of dwarfs (a–g) has given rise upon selfing to a number of "gigas" plants normal in height, with $2n = 41$ ($19_{II} + 1_{III}$). The highest frequency of gigas plants (33·5%) has been obtained by selfing b dwarfs. In the next generation, 41- and 42-chromosome plants of normal height appeared, together with occasional dwarfs. It was definitely established that the additional chromosomes in different gigas plants originating from the same dwarf lines were identical or possessed a high degree of partial homology, but were different when derived from dissimilar dwarf lines. Configurations in crosses of a–g gigas individuals with *T. polonicum*, *T. spelta*, *T. vulgare* 'Chinese Spring' and Sears's nullisomics I–XIV indicated that the extra chromosomes of the gigas types belong to the A and B genomes. The additional chromosome of a gigas plant is in every case semihomologous with the missing D chromosome of the parental dwarf line. On the basis of Kihara's investigations on intergenomic semihomologous relationships, it may be assumed that each of the 7 chromosomes of one genome is semihomologous with one in each of the other two genomes. The chromosomes of A, B and D therefore comprise respectively 7 groups of 3, designated a_A, a_B, a_D; b_A, b_B, b_D and so on. The results of the author's chromosome analysis of the dwarf and gigas a–g types are compared with those of Sears's study of intergenomic semihomologies by means of nullisomics I–XXI.

2181 KUMP, M.
Teratoid ears in *Triticum vulgare* x *Triticum dicoccum* hybrid.
Rev. sci. agric., Zagreb 1953 : **15** : 27–36. [Bull. Sci. Cons. Acad. Jugosl. 1955 : **2** : 94–95. (Abst.)].

The 3 F_1 plants obtained from the above cross, effected at the Institute of Plant Breeding and Genetics, Zagreb, grew vigorously and closely resembled the *T. vulgare* parent prior to heading. Soon after heading certain irregularities, attributed to the interaction of genetical factors from the different genomes of the parental species, were noted in the ears of all three plants. In general the ears were of the *vulgare* type, but a wide range of different forms was observed among the spikelets on the rachis. Some of the ears had a branched rachis, others had nodes without spikelets and a third category had some nodes without spikelets together with other nodes with two or more spikelets on the same node. All three plants proved completely sterile.

2182 KUMP, M.
Vulgaroid bud mutation in *Triticum dicoccum* x *Triticum monococcum* hybrid.
Rev. sci. agric., Zagreb 1953 : **15** : 39–48. [Bull. Sci. Cons. Acad. Jugosl. 1955 : **2** : p. 94. (Abst.)].

The morphological characteristics of the ears of four sterile F_1 plants obtained at the Institute of Plant Breeding and Genetics, Zagreb, from the cross *T. dicoccum* ♀ x *T. monococcum* ♂, are described. The plants were well-developed and uniform; the ears were intermediate between the two parents in some respects but tended in the main to resemble the ♀ more than the ♂ parent. One plant proved of particular interest, producing eight stalks, one of which bore an ear of the vulgaroid type. It is thought that the vulgaroid form either arose as the result of a mutation in the chromosomes of the A or B genomes or was due to the interaction of a different number of chromosomes of the A and B genomes. No influence of genome C was observed in the vulgaroid ear.

2183 MURAMATSU, M.
A hybrid between autotetraploid *Triticum aegilopoides* and *Agropyron intermedium*.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 19–20.

A mature plant ($2n = 35$) was obtained from *T. aegilopoides* var. *boeoticum* $4n$ ♀ x *A. intermedium* ♂. At metaphase I, $6–14_{II}$, $1–3_{III}$ and many univalents were observed. The formation of seven of the bivalents is ascribed to pairing between the A genomes of *T. aegilopoides* $4n$; that of the remaining bivalents is attributed to homology within and between the genomes E, F and J of *A. intermedium*.

2184 FUKASAWA, H.
Studies on restoration and substitution of nucleus (genome) in *Aegilotricum*. II. The interrelationships between *ovata* cytoplasm and fertility restoring factors.
Cytologia, Tokyo 1955 : **20** : 211–17.

Further investigations on back crosses of *Aegilotricum* (amphidiploid of *Aegilops ovata* ♀ x *Triticum durum* ♂) with *T. durum* var. *reichenbachii* ♂ and on selfs of back crosses showed that whereas plants containing 14_{II} from *T. durum* in *Ae. ovata* cytoplasm were pollen sterile, some individuals with this constitution but in addition 1_I from *Ae. ovata* were normal in pollen fertility, grains with 14 or 15 chromosomes being functional (cf. *PBA*, XXIV, Abst. 2817). The effect of the extra chromosome in restoring fertility was therefore sporophytic. With higher numbers of univalents from *Ae. ovata*, pollen fertility was in some cases high but in others low, evidently depending on the interactions between the cytoplasm and particular combination of univalents. Plants with 14_{II} and undetermined numbers of univalents were back-crossed to normal *T. durum* ♀. Derivatives with the *T. durum* genome only were almost normal in ♂ fertility, those with $14_{II} + 1_I$ less fertile. Male-sterile back crosses, containing 28 chromosomes, either from *T. durum* or both *T. durum* and *T. dicoccum*, in *Ae. ovata* cytoplasm were crossed with *T. durum* and other $4n$ wheat species. All the plants thus obtained were ♂ sterile except those from the cross with *T. dicoccoides* var. *kotschyanum*.

2185 KISS, Á.
Búza-rozs hibridek és az 1. sz. Triticale genetikai vizsgálata. (**Genetical research on wheat-rye hybrids and on Triticale 1**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1955 : **6** : 85–119.

The results of crossing various Hungarian wheat and rye varieties are reported. Bánkút 1201 wheat was the best wheat parent; selections of F 481 wheat could also be crossed successfully with rye. The wheat-rye hybrid Triticale Martonvásár 1 (Bánkút 1201 wheat x Magyaróvári rye) is described. Preliminary experiments in which wheat has been crossed with tetraploid rye have also been made.

2186 NAKAJIMA, G.
Results of crossing experiments between *Triticum* and *Secale*.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 3–4.

A table is given summarizing the results of crossing 15 species of *Triticum* with *S. cereale*, *S. vavilovii*, *S. montanum* and *S. africanum* at Gumma University, Kiryu, Japan.

2187 SUZUKI, M.
(**Fundamental studies on the breeding of rye-wheat. I. Observations on the external characters and cytology of a rye-wheat with $2n = 56$**).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 95–99. [Japanese].

The strain investigated (*Triticale* 1055) was derived from a *Triticale* x wheat back-cross made by Müntzing (cf. *PBA*, X, Abst. 1940). It resembled wheat more than rye, was self fertile and crossed most readily with either wheat or rye when used as the female parent. The modal meiotic configuration was 23_{II}.

2188 NAKAJIMA, G.
(**A cytogenetical study of an F_2 plant of *Triticum sphaerococcum* x *Secale cereale***).
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 223–26. [Japanese].

A morphological and cytological description is given of the F_2 plant referred to in *PBA*, XXIV, Abst. 999. It has $2n = 41$ chromosomes, the modal metaphase configuration being $14_{II} + 13_I$; sterility is complete.

2189 Tozu, T.
(The relation between stage of maturity of the wheat pistil and the percentage set of hybrids in wheat x rye crosses).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 119–22. [Japanese].

Four wheat varieties were used as mother plants; seed set after pollination with rye pollen was ascertained when the pollen was applied 0–13 days after emasculation. In general, the set was highest when pollination was performed 1–2 days after emasculation.

2190 Kryzhanovsky [Kryžanovskiĭ], F. D.
Wheat-Agropyrum hybrid No. 1.
Soviet Sci. Bull. 1955 : **2** : 49–51.

An English translation is given of the article referred to in Abst. 1173.

2191 Swarup, V.
A cytogenetical analysis of reactions to wheat streak-mosaic virus in certain *Agropyron-Triticum* hybrids.
Diss. Abstr. 1955 : **15** : Publ. No. 13,032 : 1706–07.

Investigations on *T. vulgare - A. elongatum* hybrids at the Kansas State College suggested that genes for reaction to the above virus are situated on long and short univalents of *Agropyron*, belonging to genome X or Y, or to both. When all the chromosomes carrying genes for resistance are present, local lesions are developed; with only a few of such chromosomes a type of reaction in which the plants initially show local lesion but later systemic infection is obtained; in the complete absence of such chromosomes the systemic reaction occurs. A few characteristics of *Agropyron*, such as long narrow spikes and kernels, appear to be associated with the local-lesion reaction.

2192 Tanaka, M.
A new amphidiploid from the hybrid *Ae. sharonensis* x *Ae. umbellulata*.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 8–10.

Amphidiploids of *Aegilops sharonensis* (S^lS^l) x *Ae. umbellulata* (C^uC^u) were obtained by colchicine treatment of the F_1 hybrids. Data from crosses between the amphidiploids and *Ae. variabilis* indicated that the genomes of the latter are homologous with those of the former. It is suggested that *Ae. variabilis* and *Ae. kotschyi* arose as amphidiploids between *Ae. umbellulata* and *Ae. sharonensis.*

2193 Pisarev, V. E.
(Amphidiploids of spring wheat x spring rye).
Bot. Ž. (Bot. J.) Moskva 1955 : **40** : 556–60. [Russian].

Amphidiploids of ♀ wheat x ♂ rye from the Cereal Institute of the Nonchernozem Belt have shown great variability with regard to fertility in the C_2 and many declined in fertility in the succeeding generations and were discarded. Fertility depended on the wheat component, as the same form of rye supplied the pollen for all combinations. For instance the amphidiploid AD17 having a Chinese wheat, No. 28742 of the Institute of Plant Industry, as the ♀ parent set 0·80 grains per ear while AD61, having another wheat from China, No. 29087, as the mother plant, set 30·00 grains per ear. With regard to most properties, including grain and ear characteristics, wide segregation was observed among the amphidiploids from the C_2 onwards. Brittle rachis was among the unwanted new characters in some C_2 plants. This is attributed to atavism. The question of the loss of fertility by the amphidiploids in later generations and of restoring fertility are briefly discussed. In this connexion continued work on the improvement of the amphidiploid AD20 (cf. *PBA*, XXV, Abst. 917) is mentioned.

2194 Müntzing, A.
Mode of production and properties of a *Triticale*-strain with 70 chromosomes.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 1–2.

A *Triticale* strain with 42 wheat and 28 rye chromosomes was produced by colchicine treatment of *Triticale* ($2n = 56$) x $2n$ rye. The strain is of no economic value since it has poor vigour and fertility and is cytologically unstable. It is suggested that *Triticale* types are fairly fertile only when the ratio of wheat to rye genomes is sufficiently high.

2195 Yamamoto, K.
(Duration of ovular potency and the pollen of rye-wheat amphidiploids and the parent species).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1953 : **4** : 185–86. [Japanese].

The period of ovular potency in the amphidiploid was 8 days, 4 days less than in the parents. The percentage of abortive pollen in the F_3 of the amphidiploid was 20·20% but dropped to 11·24% in the F_5.

2196 Medvedeva, G. B.
(So-called "maternal forms").
Dokl. Akad. Nauk. SSSR (Proc. Acad. Sci. USSR) 1955 : **102** : 161–63. [Russian].

At the Institute of Genetics direct and reciprocal crosses between *Triticum turgidum* and some winter varieties of *T. vulgare* have given a number of plants which had the same chromosome number as the seed parent and were morphologically the same.
However the F_1 from the direct crosses was characterized by heterosis for plant height, tillering capacity, length of ear and grain set. The F_1 plants from the reciprocal cross resembled the ♀ winter wheat parent in all respects except that they had a spring instead of a winter habit.

2197 Matsumura, S. & Fujii, T.
Gene mutation in Einkorn wheat induced by X-rays.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 13–14.

Frequency of gene mutation in the X_2 of *Triticum monococcum* increased linearly with dosage and increased in a nonlinear manner as the wave length decreased. The chlorophyll and other types of mutants obtained were recessive and monogenic. Var. *flavescens* was less sensitive to the mutagenic effects of X irradiation than var. *vulgare*.

2198 Matsumura, S.
Chromosome aberrations in Einkorn wheat induced by X-rays.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : p. 15.

As in previous experiments, the frequency of aberrations in the X_1 of *Triticum monococcum* increased with X-ray dosage and with decreasing wave length (cf. *PBA*, XXII, Abst. 2580). At each dosage, the frequency of aberrations was higher in var. *vulgare* than var. *flavescens* (cf. Abst. 2197).

2199 Yamashita, K.
Chlorophyll analyses in X-ray induced mutants in *Triticum monococcum*.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 16–17.

An analysis of the chlorophyll composition of yellow-green and other mutants by means of the paper-chromatographic technique is described.

2200 Mathon, C. C. & Stroun, M.
Quelques aspects de l'hybridization végétative des céréales. À propos du centième anniversaire de la naissance de Mitchourine. **(Some aspects of vegetative hybridization with cereals. On the occasion of the hundredth anniversary of the birth of Mičurin).**
Bull. Soc. bot. Fr. 1955 : **102** : 322–28.

A brief account of work on vegetative hybridization by Lysenko, Avakjan, Gluščenko, Glavinič and Cicin is presented. Recent research by the authors on wheat has shown that the progeny of plants obtained by grafting the embryo of one variety on to the endosperm of another sometimes display changes in the length of period to maturity. Such changes are transmitted to future generations if the external environment is favourable but the plants revert to the growth cycle of the original embryo parent after 2–3 generations if grown under the environmental conditions to which the embryo parent is adapted.

2201 Sultanbaev, A. S.
(The development of an accurate method for changing spring into winter wheat).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 49–60. [Russian].

Experiments on changing the spring habit of Lutescens 62 and Milturum 321 were carried out at Omsk, Moscow and Frunze. It was found that no winter forms could be obtained by merely sowing spring varieties in late autumn for one generation. A high percentage of winter forms arose however when these plants were sown again in the autumn, this time in early autumn. Most of the new winter forms were of the same botanical variety as the initial spring wheat. In addition to the winter forms, spring varieties trained for the winter habit gave rise to plants changed with regard to most morphological characteristics. Some of these pertained to other botanical varieties than the initial forms.

2202 Sergeev, V. Z.
(Facts concerning directed changing of hard spring wheat into winter wheat).
Agrobiologija (Agrobiology) 1955 : No. 6 : 45–52. [Russian].

At Rostov a hard spring wheat of var. *hordeiforme* was changed into a soft wheat of var. *erythrospermum*. First the inheritance of the hard wheat was shattered by sowing in late autumn and it was then trained for the winter habit by sowing in September for several generations. Families which surpass Odessa 3 in yield and winter hardiness have been selected. They are also distinguished by a high gluten content and resistance to smut.

2203 TRUHINOVA, A. T.
(Changing spring wheat into winter wheat under Moscow conditions).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 41–48. [Russian].

At the Institute of Genetics the spring wheats Lutescens 62, Moskovka and Milturum 321 were changed into winter wheats. First the spring habit was shattered by sowing the wheats in late autumn for one generation, then the seed of the shattered material was sown again at an unaccustomed date, the end of August or beginning of September.

2204 MITOV, L.
(Hard wheats in Bulgaria).
Priroda (Nature), Leningrad 1956 : No. 1 : 61–65. [Russian].

The following wheats have recently been obtained by single plant selection of local material at Čirpan. Melanopus 13 is notable for earliness, winter hardiness and resistance to drought and shedding. Hordeiforme 132 is hardy and resistant to diseases. Hordeiforme 788 is resistant to drought and in other respects is similar to Hordeiforme 132. The grain quality of all three varieties is good.

2205 BHADURI, P. N. & GHOSH, P. N.
SAT-chromosome of *Triticum macha*. A unique feature among *Triticum* species.
Cytologia, Tokyo 1955 : **20** : 148–49.

T. macha differs from other species of *Triticum* in having a supernumerary constriction in each of the two nucleolar chromosomes.

2206 KIHARA, H.
Considerations on the evolution and distribution of *Aegilops* species based on the analyser-method.
Cytologia, Tokyo 1954 : **19** : 336–57.

The author presents the conclusions he has reached concerning the evolution of *Aegilops* spp., based on the cytogenetical investigations he has carried out since 1918. The survey deals first with the genomic classification of the genus, in terms of the genomes of the following nine diploid analysers which are placed in three groups: C, consisting of *Ae. caudata* (C) and *Ae. umbellulata* (C^u); M, comprising *Ae. comosa* (M), *Ae. uniaristata* (M^u), *Ae. mutica* (M^t) and *Ae. squarrosa* (D); and S, containing *Ae. speltoides* (S), *Ae. bicornis* (S^b) and *Ae. longissima* (S^l). *Ae. comosa*, *Ae. speltoides* and *Ae. longissima* are regarded as including *Ae. heldreichii*, *Ae. aucheri* and *Ae. sharonensis* respectively. The geographical distribution of the 4*n* species and their putative 2*n* ancestors and the distribution of varieties within individual species are next considered. The analysers are restricted to Asia Minor, the Middle East and Balkan Peninsula, whereas the area of distribution of the whole genus is to be found in northern Africa, southern Europe and south-western Asia. Six out of the nine 4*n* species occupy a strikingly greater area than their corresponding 2*n* progenitors. Hybrid vigour may account for the wide distribution of the polyploids. It is postulated that the tetraploid species originated in the eastern Mediterranean region, where the diploid analysers converge in their distribution, and that they arose before land bridges connecting Europe and Africa had disappeared. Origin of the 2*n* species themselves in this region is however regarded as improbable. It is suggested that the genomes were already differentiated at the time of hybridization and have since undergone no or little genic and structural alteration, either within any 2*n* species or in the polyploids. The 9 tetraploid and 3 hexaploid species so far identified contain a larger number of varieties than the 2*n* analysers. The author concludes with a discussion of the evolution of the 2*n* species, based on the views expressed by Avdulov and Eig on the grounds of chromosome morphology and ear characteristics respectively.

2207 YAMASHITA, K. & KOYAMA, M.
Nucleolus organizing chromosome in Einkorn wheats.
Indian J. Genet. 1955 : **15** : 53–54; also Wheat Inform. Serv. Kyoto 1955 : No. 2 : p. 16.

Observations on configurations in heterozygotes for reciprocal translocations in *Triticum aegilopoides* and *T. monococcum* indicated that chromosome d is the nucleolar organizer.

2208 PERSON, C.
Some aspects of monosomic wheat breeding.
Canad. J. Bot. 1956 : **34** : 60–70.

All monosomic plants studied were partially asynaptic, the frequency of meiotic cells containing three or more univalents being highest in the F_1 hybrids from crosses between monosomic female parents and normal male parents and decreasing with successive back-cross generations. Rings of four also occurred in monosomic plants, most commonly in F_1 and early back-cross generations. The hybrid progenies were largely monosomic or disomic but also contained a small proportion of (1) doubly monosomic individuals with 40 chromosomes, (2) 42-chromosome plants trivalent for one chromosome and deficient for another and (3) trisomic plants with 43 chromosomes. It is shown that these irregular caryotypes and the "univalent shift," a term used to describe the process whereby a monosomic plant occasionally produces offspring lacking a different chromosome from the one lacking in the parent, can all occur as the result of the random distribution of unpaired meiotic chromosomes in the partially asynaptic monosomic parent.

2209 NODA, A. & MATSUFUJI, Y.
(**Studies on intervarietal differences in the growth of agricultural crops in response to cultivation on reclaimed acid soil. The growth response of wheat without application of fertilizers**).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1953 : **5** : 175–80. [Japanese].

The growth rates of a series of Japanese varieties were compared when grown on normal and on a reclaimed soil, the latter being highly acid (pH = 4·33) and having a high Al content. Varietal differences in the extent to which growth was inhibited by the conditions provided by the reclaimed soil were noted. The varieties least injured, such as Hiraki and Norin [Ministry of Agriculture and Forestry] 26, appeared to accumulate Al ions less readily in the root cells.

2210 SUEMOTO, H. & KOJIMA, K.
Right- and left-handedness in *Triticum* and *Aegilops*. I.
Wheat Inform. Serv. 1955 : No. 2 : 10–11.

Information is given on methods of estimating the concordance proportion (C) and mean concordance proportion ($\bar{C}$) with respect to the above character. Analysis of *T. monococcum* var. *flavescens* indicated that regularity appeared with the third or fourth leaf and was maintained up to the tenth spikelet or its vicinity, disappearing at approximately the twentieth spikelet.

2211 SUEMOTO, H. & KOJIMA, K.
Right- and left-handedness in *Triticum* and *Aegilops*. II. $\bar{C}$ values among species of *Triticum* and *Aegilops*.
Wheat Inform. Serv. 1955 : No. 2 : 12–13.

Some relationship was found between $\bar{C}$ and genomic constitution (cf. Abst. 2210). Genomes A and D were associated with regularity in the expression of right and left handedness; genomes B and G appeared to suppress the effect of A. Species with genomes C, C^uC^u, M and S^1 had low values for $\bar{C}$.

2212 PAPP, ZS.
Őszi buzafajták csiragyökér és hajtásvizsgálata. (**Studies on primary roots and shoots in winter wheat varieties**).
Növénytermelés 1954 : **3** : 323–32.

In fourteen wheats studied at the Budapest Institute of Plant Variety Testing, tillering capacity and growth rate of the first leaves were associated, the varieties falling into three groups with (1) rapid growth of initial leaves and vigorous tillering, (2) intermediate growth rate and moderate tillering and (3) slow growth and slight tillering. Intervarietal differences in growth rate of the early leaves was most marked when germination was carried out in the dark.

2213 STROUN, M.
À propos du photostade du blé "Fylgia." (**On the photostage of the wheat Fylgia**).
Bull. Soc. bot. Fr. 1955 : **102** : 318–22.

When planted in the autumn the soft wheat Fylgia was found to possess considerable winter hardiness and also had the dark green foliage characteristic of winter wheats. Sown in April it eared in August but, when sown a month later, it failed to reach the reproductive stage. It is concluded that Fylgia is not a true spring wheat but is in fact an alternative wheat with special phasic requirements.

2214 GRIES, G. A., STEARNS, F. W. & CALDWELL, R. M.
Responses of spring wheat varieties to day-length at different temperatures.
Agron. J. 1956 : **48** : 29–32.

All the varieties studied, viz. White Federation, Progress, Warden and Chinese, flowered over the entire range of day lengths used but became progressively earlier as the photoperiod increased from 8 to 24 hr. Chinese was less sensitive to photoperiod than the other varieties; it was the earliest to flower with a day length of 8 or 10 hr. at 50–70° F.; with photoperiods of 16 hr. or more at 50–80° F. or with short day lengths at 80° F., it was the latest. The varieties differed markedly in number of total hours of illumination required for flowering, the most efficient utilization of light occurring with an 8-hr. day in Chinese and a 16-hr. day in the other varieties. The dark period is probably an important factor in the maximum efficiency of light utilization. The flowering behaviour of the varieties under field conditions and the wide range of variation in earliness among Chinese x winter wheat selections with winter habit are interpreted in the light of these results.

2215 Hänsel, H.
Entwicklungs-Relationen verschiedener Organe von Winterweizen (*Triticum aestivum* L.). (**Developmental relationships of different organs of wheat *T. aestivum* L.**).
Z. Pflanzenz. 1955 : **35** : 117–36.

Three varieties grown in lower Austria were examined in respect of growth habit, development of the ear primordia and the relationship between the growth of different parts of the plant in as far as it involved competition for available supplies of nutrients. The effect of adding different fertilizer to the soil at various stages during the growth of the plant was also studied. Basing his recommendation on observations of the interaction between genetical constitution and external environmental conditions, the author suggests that increased attention should be paid to breeding for improved tillering ability, short straw and early maturity combined with the greatest possible number of spikelets per ear. The character short straw is of particular importance as it reduces competition for available nutrients at the time of ear emergence.

2216 Dionigi, A.
Qualità: secondo traguardo per la genetica dei frumenti. (**Quality, the second aim in wheat genetics**).
G. Agric. Domen. 1956 : **66** : p. 37.

Reference is made to the variety Ovest (cf. Abst. 254), capable of giving reliable yields in mountain districts in Italy, to Forlani and Elia (cf. Abst. 2222) which are suitable for medium altitudes and to others suitable for the areas of low fertility in southern Italy, which together have largely solved the problem of wheat yield in Italy. Attention is also being given to quality and analyses are being made of the flour of all the main wheat varieties now in cultivation.

2217 Samsonov, M.
(**Baking quality and the evaluation of wheat varieties by their strength of flour**).
Zemledelie (Agriculture) 1955 : No. 11 : 109–12. [Russian].

Data showing baking quality and alveogram values for a number of winter varieties and hard and soft spring wheats are presented. All of them are strong wheats and all except Saratov 210 are characterized by baking quality of a high order. The defect of Saratov 210 is its low tensile strength. However it makes a good improver for varieties with a low gluten content. Kahi 8, a winter variety from Georgia, was notable for its high alveogram value; the strength of its flour exceeded that of Surrubra, hitherto regarded as the strongest wheat.

2218 de Pando Z., O. & Rodríguez E., M.
Estudio comparativo físico, químico y bioquímico de algunas de las principales variedades de trigo cultivadas en la Costa y Sierra del Perú. (**A comparative physical, chemical and biochemical study of some of the main wheat varieties cultivated in the coastal and highland areas of Peru**).
Agronomía, Lima 1955 : **20** : No. 83 : 31–37.

Analyses of a number of wheat varieties in respect of physical characteristics, nutritive properties and baking quality showed that some were good in all respects, others good in nutritive properties and poor in quality and others good in quality but not remarkable in nutritive properties.

2219 Cortázar S., R.
Mejoramiento del trigo candeal. (**Breeding hard wheat**).
Agricultura téc., Santiago 1954 : **14** : 100–04.

Trials of some 400 varieties of *Triticum durum* have shown that none of the forms introduced from abroad is suitable for replacing Capelli*, which is the sole variety grown in Chile at present but which has gradually lost its resistance to *Puccinia graminis*. Hybrids of Capelli x Giza back crossed once or twice with Capelli and then allowed to self pollinate have given rise to several resistant forms which in grain properties are indistinguishable from Capelli. Some of them are stronger in the straw than Capelli and all are more reliable in yield because of their rust resistance.

Crosses of Capelli with other varieties of *T. durum* are now under investigation.

2220 Zweifel, J. & Keller, C.
Le froment d'automne Cappelle. (**The winter wheat Cappelle**).
Rev. rom. Agric. 1955 : **11** : 73–77; also Publ. Sta. féd. essais agric. Lausanne 1955 : No. 487 : Pp. 12.

This new wheat was recently introduced into

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* *sic*; possibly equivalent to the Italian Cappelli.

Switzerland from France (cf. Abst. 1167) and in trials carried out at the Zürich-Oerlikon and Lausanne Federal Agricultural Research Stations it has outyielded all other varieties with which it was compared. Its superiority in yield was more pronounced on soils of high than on those of low fertility. The baking quality of the flour is considered to be superior to that of MC 245 but markedly inferior to that of Probus.

2221 SEDLMAYR, K.
Die Ertragsanalyse des Weizens. (**Yield analysis of wheat**).
Acta agron. 1954 : **4** : 37–68.

Wheat yield may be analysed into the following components: (1) kernel weight per spike, which is dependent on (*a*) 1000-grain weight, (*b*) the number of spikelets per spike, a function of the length and density of the spike and (*c*) the number of kernels per spikelet, a value depending on the number of flowers and the proportion of fertilization occurring; and (2) the number of spikes per unit area, a character associated with plant stand and tillering capacity. Methods of computing the various yield components are discussed and examples are given of yield analyses of a number of Hungarian and other wheats. It is suggested that in breeding for increased yield parents owing their high yields to different components should be combined.

2222 DIONISI, A.
"Elia" il grano della tranquillità per le colline d'Italia. (**Elia, a wheat making for tranquillity in the hills of Italy**).
G. Agric. Domen. 1955 : **65** : p. 346.

The wheat Elia, a hybrid of Est x Libero, resembles Roma in general type and qualities but has stronger straw, is more resistant to the rust races prevalent in Italy and, most important of all, has a lower rate of development in the early growth phases and hence is not damaged by late frosts; it matures rapidly in the spring and is not damaged by summer drought and is regarded as an ideal wheat for the Rieti plateau and similar regions in Italy, where it yielded 40–45 c. per ha. in 1955, when most other varieties suffered seriously from frosts in late April, followed by a bad summer.

2223 CHIRILEI, H.
Individualization of protoplasm of the cells of winter cereals and resistance to frost.
Rev. Biol., Bucureşti 1954 : **2** : 128–37.

Withdrawal of the protoplasm from the cell wall with concomitant rupture of the plasmodesmata occurs in overwintering cereals. A comparative study of seven wheat varieties and the barley Cenad 396 revealed that resistance to frost was correlated with frequency of cells thus affected, the wheat variety Bărăgan being most frost-resistant. Protoplasmic withdrawal was accompanied by an accumulation of lipids and lipoids in the cell.

2224 ČEČKO, F. E.
(**Wheat varieties for virgin lands**).
Dostižen. Nauk. pered. Opyt. seljsk. Hozjaĭstv. (Achiev. Sci. progr. Exp. Agric.) 1955 : No. 12 : 32–33. [Russian].

In recent Kazah trials Hordeiforme 10 has shown resistance to drought and produced a much higher yield of grain than the spring wheats Smena [Change] and Akmolinka 1 [Akmolinsk Dweller 1].

2225 DE BENI, U.
Brevi note sulla nuova varietà di grano Produttore (S.6). [**Short notes on the new wheat variety Produttore (S.6)**].
Sementi elette 1955 : **1** : No. 1 : 26–29.

Strain S.6 gave grain yields varying from 57·29 to 74·58 c. per ha. in the period 1952–55 and having proved markedly superior to all other varieties with which it was compared in the Bologna region of Italy, it has been named Produttore [Yielder]. A selection from a cross of Salto (= Tiriamo diritto) x line 217 from Saytana 27 x Quaderna made in 1944, it is a winter bread wheat characterized by good standing capacity and is suitable for rich land.

2226 FAVERO, A.
Due nuovi frumenti: Stirpe 1494 e Robi. (**Two new-wheats: Stirpe 1494 and Robi**).
Sementi elette 1955 : **1** : No. 1 : 67–68.

Stirpe 1494 [Strain 1494], of the Bologna plant breeding institute, is a winter wheat selected from Funo x Lauro Bassi and characterized by cold resistance and good standing capacity; it is suitable for cultivation in the plains and on high ground. The winter wheat Robi, a selection made by L. Sossai from a cross Inalettabile 96 [Nonlodging 96] x Re di Baviera [King of Bavaria], is resistant to cold and lodging and also suitable for high ground.

2227 BONVICINI, M.
Nuove caratteristiche genetiche per l'incremento della produzione granaria. (**New genetic characteristics for increasing agricultural production**).
Sementi elette 1955 : **1** : No. 1 : 8–13.

The author insists on the importance of lodging resistance in all new wheat varieties designed to increase yield and refers to some dwarf forms which have appeared in numerous crosses at the Istituto di Allevamento Vegetale [Plant Breeding Institute] at Bologna in Italy. By crossing them with other varieties, a series of hybrids of low stature but distinguished by high yield, quality and disease resistance has been produced.

Another promising series of hybrids has been obtained by crossing plants of *Triticum vulgare* with branched ears, which have appeared sporadically in certain hybrid families, with varieties superior in other respects. Others have been produced by crossing the best soft wheats with a branched form of *T. turgidum.*

2228 VALDEYRON, G.
Enseignements techniques à tirer de la campagne de céréales 1954–55 en Tunisie. (**Technical lessons to be drawn from the 1954-55 cereal season in Tunisia**).
Tunis. agric. 1955 : **56** : 143–51, 155–63.

Information is included on the yielding capacity and disease resistance of the principal varieties of hard and soft wheat grown in Tunisia. Importance is being attached to breeding for resistance to mealy endosperm and studies have been made of the relationship between the occurrence of this disorder and the nitrogen content of the soil. Varietal differences in resistance to mealy endosperm are noted; Bidi 17 is the least susceptible variety.

2229 FAJERSSON, F.
Våra vanliga vetesjukdomar och viktigare vårvetesorters resistens mot dem. (**Our common wheat diseases and the resistance of important spring wheat varieties towards them**).
Weibulls ill. Årsb. 1956 : **51** : 3–6.

Notes are provided on the resistance of the Swedish varieties Svenno, Kärn II, Pondus, Brons [Bronze] and Drott [King] to mildew, rusts, smuts, *Cercosporella herpotrichoides*, *Ophiobolus graminis* and *Fusarium* diseases.

2230 LUPTON, F. G. H.
Resistance mechanisms of species of *Triticum* and *Aegilops* and of amphidiploids between them to *Erysiphe graminis* DC.
Trans. Brit. mycol. Soc. 1956 : **39** : 51–59.

Seedling leaves of resistant and susceptible species of *Triticum* and *Aegilops* and of amphidiploids between these species were inoculated with race 4 of *E. graminis*. In resistant species and amphidiploids, three types of resistance were distinguished: (1) as in *T. carthlicum*, *T. dicoccum*, *T. timopheevi* and *Ae. caudata*, appressoria penetrated the cuticle but not the epidermal cell walls; (2) as in *Ae. speltoides*, both the cuticle and epidermal cell walls were penetrated but invasion of the host was halted on account of the hypersensitivity of the epidermal cells which were killed upon contact with the fungus; and (3) haustoria were formed in the epidermal cells but soon degenerated and died, as in *Ae. ovata*. The possible nature of these types of resistance is discussed.

2231 NAKAGAWA, M.
(**Studies on the resistance of wheat varieties to *Gibberella saubinetii*. III. The relation between percentage of diseased spikes, percentage of diseased spikelets and percentage of diseased grains in relation to infestation by *G. saubinetii***).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 100–06. [Japanese].

In continuation of the researches summarized in Abst. 1175 and using the same 7 wheat varieties, the author found that any of the three values cited could be used for estimating varietal susceptibility. The varieties differed in the mode of distribution of infected grains along the spike.

2232 NAKAGAWA, M.
(**Studies on the resistance of wheat varieties to *Gibberella saubinetii*. IV. Alcohol fermentation by *G. saubinetii***).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 107–09. [Japanese].

The present paper in this series (cf. Abst. 2231) reports that alcoholic fermentation of the translocation fluid or kernel extract of wheat is generally higher in the case of varieties susceptible to the above pathogen.

2233 BATTS, C. C. V.
Loose smut (*Ustilago tritici* (Pers.) Rostr.) of wheat: physiologic specialization and reaction of varieties in England.
Ann. appl. Biol. 1955 : **43** : 533–37.

Three physiological races of loose smut, C_1, C_2 and C_3, found on wheats grown in Cambridge, England, have been identified by means of Oort's differential varieties. The reaction of 57 wheats to the three races, none of which is identical with any previously found in the Netherlands (cf. *PBA*, XVIII, Abst. 793), has been determined.

2234 SĂVULESCU, T.
Die physiologischen Rassen von *Tilletia foetida* (Bauer) Liro und die den Steinbrand hervorrufenden *Tilletia*-Arten in der Rumänischen Volksrepublik. [**Physiological races of *T. foetida* (Bauer) Liro and species of *Tilletia* causing bunt in the Rumanian People's Republic**].
Phytopath. Z. 1956 : **25** : 267–310.

The morphology and life cycles of *T. foetida*, *T. tritici*, *T. triticoides*, *T. intermedia* and *T. nanifica* were studied and the influence of light intensity, temperature and degree of humidity on spore germination was determined. Of the 20 physiological races of *T. foetida* isolated, 6 proved capable of attacking all the 11 principal wheat varieties grown in Rumania. Varietal differences in susceptibility to the other 14 races of *T. foetida* and to 9 physiological races of *T. triticoides* were noted.

2235 AEBI, H.
La carie naine du froment. Aspect actuel du problème en Suisse. (**Dwarf bunt of wheat. Appearance of the problem in Switzerland today**).
Rev. rom. Agric. 1955 : **11** : 65–68; also Publ. Sta. féd. essais agric. Lausanne 1955 : No. 472 : Pp. 12.

This article on the occurrence of *Tilletia brevifaciens* in Switzerland provides information on the comparative incidence of the pathogen in different parts of the country, methods of combating it by chemical means, the identification of different physiological races at the Federal Agricultural Research Station, Lausanne, and the development of resistant varieties. Crosses were carried out between resistant American and susceptible Swiss varieties. The F_2 generations produced various percentages of resistant plants and an association was established between the number of resistant plants and the resistant parent employed in the cross. The best results were obtained when the American varieties (25–15) x Rex-Rio, Wasatch, Brevor, Elmar, Hussar or Hymar were used. Three physiological races of the pathogen, designated N, W and P, were identified. Race N is the race most commonly found in Switzerland and most of the American varieties, including Wasatch, were resistant to it. Race W proved capable of attacking Wasatch. Race P, a less virulent strain than N, is relatively unimportant. The relationship of *T. brevifaciens* with *T. secalis*, which attacks rye, and *T. controversa*, which attacks *Agropyron intermedium*, is discussed. Experiments showed that the three species are distinct and that each is limited in its range of pathogenicity to its specific host plant.

2236 ZSCHEILE, F. P.
Some physiological aspects of bunt resistance in wheat.
Plant Physiol. 1955 : **30** : 432–37.

With a view to obtaining information to secure the maximum degree of varietal differentiation with respect to bunt resistance, investigations were carried out on several combinations of treatments involving temperature, incandescent and fluorescent light, light intensity and photoperiod in relation to the expression of infection due to race T–1 of *Tilletia caries* in the susceptible variety Baart and resistant variety Baart 38.

2237 HIRATSUKA, N.
Reaction of *Aegilops* and *Triticum* to *Puccinia graminis* Pers. and *Puccinia glumarum* Eriks. et Henn.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 5–7.

A table is given providing information on the reactions shown by *Aegilops* spp. and *Triticum* spp. to the above pathogens in tests at the Faculty of Agriculture, Tokyo University.

2238 SIKKA, S. M.
Genetics of disease resistance and other characters in wheat and its bearing on the improvement of the crop in India.
Indian J. Genet. 1955 : **15** : 1–14.

The text is given of the presidential address delivered at the fourteenth annual meeting of the Indian Society of Genetics and Plant Breeding held at Baroda during January 1955. Literature on the inheritance of reaction to rusts and other diseases, resistance to lodging, drought and frost, and properties affecting quality is surveyed with reference to problems of breeding wheat for India.

2239 LUKJJANENKO, P. P.
(**Using Mičurinist methods in breeding winter wheats**).
Zemledelie (Agriculture) 1955 : No. 10 : 25–36. [Russian].

An account of breeding work at Krasnodar, together with descriptions of new varieties, most of them distinguished by resistance to rust and lodging, is given. All except Novoukrainka 84, Skorospelka 3b [Early 3b] and Bezostaja 4/1 have been previously referred to in *PBA*, XXVI, Abst. 310.

Novoukrainka 84 was obtained by single plant selection from the standard Novoukrainka 83. It is a strong-floured wheat which outyields the standard by a good margin. Skorospelka 3b was selected from Skorospelka 3 (Kanred-Fulcaster x Klein 33). It is characterized by increased yield and improved resistance to diseases, notably rust and bunt. Bezostaja 4/1, selected from Bezostaja 4, has invariably outyielded the initial variety in recent trials.

2240 FEDORENKO, I. P.
(A high-yielding variety of winter wheat).
Dostižen. Nauk. pered. Opyt. seljsk. Hozjaĭstv. (Achiev. Sci. progr. Exp. Agric.) 1955 : No. 11 : 52–54.

In recent Ukrainian trials a good new bread wheat, Veselyĭ Podol 499 (Milturum 14 x Covelle), has invariably outyielded Lesostepka 75 [Woody Steppe 75], a standard in the Poltava province. It shows resistance to *Puccinia*, drought and lodging and has large semivitreous grain.

2241 HERNÁNDEZ, D. VOLOSKY DE
Comportamiento de variedades y cruzamientos de trigos de Paine al "Polvillo anaranjado", 1952. **(Reaction of wheat varieties and crosses from Paine to yellow rust in 1952).**
Agricultura téc., Santiago 1954 : **14** : 105–09.

Data are presented showing the percentage infection of hybrids from 25 wheat crosses by the Chilean races of *Puccinia glumarum* (cf. *PBA*, Vol. XXV, Abst. 2944). Resistant lines were found among the hybrids Kenya x Lincoyán, Premier x Sinvalocho, Thatcher x Lincoyán and Thatcher x Santa Catalina. Certain varieties such as Frontana, Kenya, Thatcher and certain derivatives of H–194 are also indicated as being resistant.

2242 SEN, S. & JOSHI, M. G.
Inheritance of resistance to black rust in wheat.
Indian J. Genet. 1955 : **15** : 36–46.

According to data from E220 (introduction from Kenya) x Pb.C591 and E569 (Gabo) x NP761, adult-plant resistance to black rust (*Puccinia graminis* var. *tritici*) depended on a single pair of genes, susceptibility being dominant. In E569 x NP761, E569 x Niphad 4 and E220 x Pb.C591, inheritance of awn development depended upon a single pair of genes and, in the last cross, also upon modifiers; the long-tipped condition was in each case dominant to full beardedness. Data from E569 x Niphad 4 and E220 x Pb.C591 indicated that pubescence of the glume was dominant over glabrousness and monofactorial. In the latter cross, complementary factors conditioned glume colour, an F_2 ratio of 9 : 7 being obtained with respect to brown and white glumes. None of the characters studied were linked.

2243 SALAZAR, J.
Reacción de diversas variedades de trigo a tres razas de *Puccinia graminis* f. sp. *tritici* Eriks. et Henn., comunes en España. **(Reaction of different varieties of wheat to three races of *P. graminis* f. sp. *tritici* Eriks. et Henn. common in Spain).**
Bol. Inst. Invest. agron., Madr. 1955 : **15** : 423–37.

Observations were made on the reaction of 79 varieties belonging to six different species, in respect to races 21 and 17 and another referred to as race A, which attacks Khapli and does not correspond to any internationally recognized biotype. *Triticum timopheevi* var. *viticulosum* was free from attack by any of the three races, as were Kenya C9.724 and Newthatch; Andalucía 344 (*T. durum*) was immune from race 17 and resistant to 21 and A; Fartó 33 (*T. turgidum*) was immune from 21 and A and resistant to 17 and in other tests has been shown to be resistant also to races 14 and 24 and to other species of rust and other diseases; Pilot was immune from races 17 and 21 and resistant to A; and Thatcher and Gabo were immune from A and resistant to 17 and 21; four varieties are indicated as being resistant to all three races and others as resistant to one or two of them.

2244 HEYNE, E. G. & JOHNSTON, C. O.
Inheritance of leaf rust reaction among the eight differential varieties of wheat.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 4–5.

At the Kansas Agricultural Experiment Station, inheritance of reaction to leaf rust has been studied in all possible crosses involving eight differentials (Malakof, Democrat, Hussar, Mediterranean, Carina, Loros, Webster and Brevit), Pawnee and Wichita. Some information additional to that already reported is provided (cf. *PBA*, XXV, Abst. 1733). Brevit and Carina show the same response to race 9 but their genes for resistance appear to be non-allelic; Brevit and Hussar give similar reactions to this race, probably as the result of two closely linked factors. In hybrids involving Pawnee, the same factor determines resistance to races 9, 10, 11, 13, 19, 20, 31 and 93. Monosomic analysis has revealed that the factor in Pawnee for resistance to race 9 is located on chromosome X. Inheritance of leaf-rust reaction is also being studied by monosomic analysis. In addition, the factors for rust resistance carried by the differentials are being transferred to a common genetic background by back crossing to Wichita.

2245 NELSON, R. R., WILCOXSON, R. D. & CHRISTENSEN, J. J.
Heterocaryosis as a basis for variation in *Puccinia graminis* var. *tritici*.
Phytopathology 1955 : **45** : 639–43.

Fusion was observed to occur between hyphae from uredospores of different races grown as a mixture on agar. In inoculation studies with mixtures of uredospores of different races, it was found that the first uredial generation after inoculation of the completely susceptible variety Little Club with a mixture of biotypes of races 38 and 56 was pathogenic on Khapli emmer, which is highly resistant to both races, and showed increased virulence on susceptible varieties. Some of the uredospores of the new heterocaryotic biotype had three or four nuclei while those of races 38 and 56 were binucleate. The multinucleate form was unstable and became less virulent with successive generations, giving rise through dissociation to the original binucleate races and to two new races, designated A and B, which are distinct from any other known races of *P. graminis*.

2246 WATANABE, Y., MUKADE, K. & SAITO, S.
(**Studies on the production of amphidiploids as a source of resistance to leaf rust in wheat. I. Cytogenetical studies on the F_1 hybrid of *Triticum Timopheevi* Zhuk. x *Aegilops squarrosa* L. and on the amphidiploid**).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 75–86. [Japanese].

The modal meiotic configuration of the F_1 hybrid of the above cross is 21_{I}. On treatment with 0·05% colchicine, amphidiploids were readily obtained, also one haploid. The modal meiotic configuration of the amphidiploids was 21_{II}, of the haploid $I_{II} + 19_{I}$ or $2_{II} + 17_{I}$. The amphidiploids were similar to *T. spelta* morphologically; the spikelets were awned. They were immune from many races of *Puccinia triticina* and crossed readily with *T. timopheevi*, *T. vulgare*, *T. compactum*, *T. macha* and rye, and less readily with *T. sphaerococcum*, *Agropyron glaucum* and *Haynaldia villosa*. They did not cross with *Ae. squarrosa*.

2247 Vergleichende Untersuchungen über die Säuren und Zucker des Grundstoffwechsels an Weizensorten unterschiedlicher Rostanfälligkeit. (**Comparative investigations on the acids and sugars in the basal metabolism of wheat varieties varying in susceptibility to rust**).
Naturwissenschaften 1956 : **43** : p. 40.

The yellow-rust resistant variety Chinese 166 was found to contain a lower percentage of organic acids than the susceptible variety Michigan Amber. No differences were ascertained between the two varieties as regards content of glucose or other sugars.

2248 WIGGIN, H. C.
Monosomic analysis of stem rust reaction and awn expression in Kentana 52 wheat.
J. Hered. 1955 : **46** : 239–42.

The results of crosses between the spring wheat Kentana 52 and monosomic lines of Chinese indicate that chromosome XX of Kentana 52 carries two dominant genes governing resistance to stem rust races 56 and 15B respectively, the recombination value being 37·6 ± 4·6. Genes determining awn development in Kentana 52 lie on chromosomes II, VIII, XII, XVI and XX and appear to correspond with the factors a_1, hd, a_3, a_4 and a_2 respectively, reported by Heyne and Livers (cf. *PBA*, XXIII, Abst. 1892).

BUCKWHEAT

2249 ŽEBRAK, A. R. & ŽEBRAK, Ė. A.
(**Variability of intervarietal amphidiploids of buckwheat**).
Dokl. Akad Nauk SSSR (Proc. Acad. Sci. USSR) 1955 : **102** : 157–60. [Russian].

An abridged account of the work on tetraploids referred to in *PBA*, XXV, Abst. 2959 is presented.

OATS

2250 **Oat variety trials 1935-53.**
Scot. Agric. 1955–56 : **35** : 136–37.

Information is given on the merits of Blenda, Forward and seven other varieties, as judged from the results of trials carried out in Scotland during the above period.

2251 Mac Key, J. & Månsson, T.
Ett aktuellt sortiment av havresorter av högt odlingsvärde. (A current assortment of oat varieties of high agronomic value).
Allmänna Svenska Utsädesaktiebolaget, Svalöf 1956 : 9–12.

The suitability of a number of varieties for different parts of Sweden is discussed in relation to their performance in trials conducted over the period 1950–54.

2252 Hagberth, N. O.
Pendekhavre. (**Pendek oats**).
Weibulls ill. Årsb. 1956 : **51** : p. 28.

Information is given on the performance of the early, short-strawed Netherlands variety Pendek in Sweden (cf. Abst. 1204).

2253 Wallace, A. T. & Chapman, W. H.
Studies in plot technique for oat clipping experiments.
Agron. J. 1956 : **48** : 32–35.

The optimum plot size for estimating forage production was found to be a single row 8′ long; 4–5 replications were required. An experiment with three varieties of different habit showed that distance between the rows (9 or 18″) and seeding rate did not affect the relative performance of the varieties. Grazing was best simulated by cutting manually with a kitchen paring knife.

2254 **Purdue University develops, releases new oat varieties.**
What's New Crops Soils 1955 : **8** : No. 1 : p. 28.

Two new oat varieties developed at Purdue University Agricultural Experiment Station, Ind., are to be released in 1956. Bentland resembles Clintland in crown rust resistance and Benton in other characters. Newton has given particularly high yields in hot, dry seasons and performs better than the Clinton strains in southern Indiana.

2255 Wiggans, S. C.
The effect of seasonal temperatures on maturity of oats planted at different dates.
Agron. J. 1956 : **48** : 21–25.

According to the results of experiments at the Iowa Agricultural Experiment Station, the number of heat units (over 40° F.) from sowing to maturity differs according to the variety but varies little from year to year for any given variety.

2256 McIntosh, T. P.
Identifying Svalöf oat varieties by grain characters.
J. Inst. Corn. Merch. 1956 : **5** : 119–26.

The chief diagnostic features of the grains and groats of seven Svalöf varieties are described and illustrated with drawings and photographs.

2257 Grafius, J. E.
The interaction of genotype and night temperature in oat and barley varieties.
Agron. J. 1956 : **48** : 56–59.

A method is suggested for determining the interaction between genotype and night temperature under field conditions. Evidence has been obtained suggesting that this interaction may be important as a factor influencing yield. Curves for the interaction fit the equation $y = c10^{kt}$, where y = yield as a percentage of the mean for the locality and t = average daily minimum temperature over a given period. The values c and k are varietal constants.

2258 Zillinsky, F. J.
Oat breeding and research in Canada.
Agric. Inst. Rev. 1955 : **10** : No. **6** : 11–13, 56.

This popular article is concerned chiefly with the results of breeding for resistance to rusts, smuts and other fungous diseases over the past 20 years.

2259 Morey, D. D.
Smut resistance of some southern oat varieties.
Plant Dis. Reptr. 1955 : **39** : 960–62.

Varieties and selections were tested at the Coastal Plain Experiment Station, Tifton, Ga., for resistance to two collections consisting chiefly of loose smut. Bronco (CI6571), CI6717 (Lee-Vic. x Fulwin), CI6744 [(Vic. x H–B) x Fulghum-Vic.], Seminole, Coker 53–29 and Delair were highly resistant. CI6909 and CI7078, both from Landh. x (Mindo x H.J.) x And., CI6671 (S. Fe.-Cl. x Sac.-H.J.) and two selections from Canada, 3928–5–4 and 3928–5–8, combine resistance to smut and rust. Many derivatives of Lee-Victoria were susceptible. Victorgrain 48–93, Fulgrain, Arlington and most Red Rustproof types were intermediate in susceptibility.

2260 **New oat variety is highest yielder.**
What's New Crops Soils 1956 : **8** : No. 5 : p. 25.

Garry, a rust-resistant variety developed at the Dominion Laboratory of Cereal Breeding, Winnipeg, Manitoba, has given considerably higher yields than Mohawk and Clinton under both rust-free and rust-infected conditions in New York state (cf. *PBA*, XVII, Abst. 1410).

2261 SIMONS, M. D.
Physiologic races of crown rust of oats identified in 1954.
Plant Dis. Reptr. 1955 : **39** : 949–55.

Analysis of 704 uredial collections made in the USA in 1954 revealed the presence of 29 races, of which races 280 to 285 occurred for the first time. Race 202, attacking Anthony, Appler and Bond, was the most prevalent, constituting 30% of the total number of isolates. Race 203 was second and race 258 third in prevalence, accounting for 21% and 14% of the isolates respectively.

2262 SIMONS, M. D.
An examination of the present status and proposed modifications of the annual crown rust race survey in the United States.
Plant Dis. Reptr. 1955 : **39** : 956–59.

Use of a special set of differential oat varieties for detecting new aggressive races is advocated, the components of such a set being changed as often as the situation demanded. In order to obtain less biased data on the prevalence of known races than those secured by the present system of survey, it is proposed that only single isolates from collections made on completely susceptible varieties of oats, such as Markton and Richland, should be used, racial identification being accomplished by means of the standard set of ten differentials.

2263 CENÓZ, H. P. & VALLEGA, J.
Razas fisiológicas de *Puccinia coronata avenae* en la región cerealera Argentina. (**Physiological races of *P. coronata avenae* in the cereal region of Argentina**).
Rev. Invest. agríc. B. Aires 1955 : **9** : 325–40.

Using the new set of differentials (cf. *PBA*, XXV, Abst. 972), the group originally designated Arg.1 (cf. *PBA*, XIV, Abst. 521) has been shown to comprise 13 distinct races, the only varieties resistant to all of them being Bond and Victoria; four of them, viz. 261, 277, 278 and 287, are capable of attacking Santa Fe. Arg.45 comprises race 262, which attacks all oat varieties except Victoria and its derivatives, and the related races 263, 276, 203 and 265. Arg.55 comprises races 213, 279 and certain others, all attacking both Bond and Victoria. Arg.56 comprises races 258 and 259, also attacking Victoria. The distribution of the races remains substantially unchanged since 1939, the races comprising group Arg.1 being the most prevalent. It is pointed out that the differentials Anthony and Trispernia give varying reactions and obviously require purifying, and that the restoration of Ruakura among the differentials would lead to the further subdivision of some of the races.

A combination of the resistance genes contained in Victoria and Santa Fe gives resistance to all the races so far identified in Argentina, as shown by selections Magnif 29 (Tama x Santa Fe) and Magnif 28 (Klein Mar [Sea] x Santa Fe).

2264 HOOKER, A. L.
***Septoria* reactions of entries in the north central states uniform oat yield nursery and other strains in 1955.**
Plant Dis. Reptr. 1955 : **39** : 963–66.

Varietal differences in reaction to the leaf, stem and kernel phases of infection by *S. avenae* were observed among the 153 oats tested at Madison, Wis., during 1955. The responses of a given variety to the different phases showed some association; varietal differences were however most distinct with stem infection. Higher percentages of infection were obtained by artificial inoculation than natural infection but the ranking of the varieties was similar. Several entries showed low percentages of infection.

2265 LUND, S. & SHANDS, H. L.
The response of oat strains to *Septoria avenae*.
Phytopathology 1956 : **46** : 48–50.

Of about 3500 strains from the USDA World Oat Collection, some 250 showed a useful degree of resistance to a composite inoculum of several isolates of *S. avenae* from the north-central USA. Many proved to be equal or superior in resistance to the resistant variety Clintafe. High resistance was frequently associated with late heading and maturity.

2266 CRAIGMILES, J. P. & JENSEN, N. F.
Determining disease losses in oats.
Agron. J. 1955 : **47** : p. 591.

Data are given on the differences in yield reduction due to infection with *Helminthosporium victoriae* in three resistant, six segregating and three susceptible lines grown at Ithaca, NY. The lines were otherwise isogenic, being derived from a selection from Ithacan x Victoria, selfed for 11 generations.

2267 TVEIT, M.
Pathogenicity of species of Helminthosporium from Brazilian oats.
Phytopathology 1956 : **46** : 45–48.

On the basis of their pathogenicity on eight oat varieties, cultures of both *H. victoriae* and *H. avenae* isolated from Brazilian oats fell into several distinct races. Andrew was immune from all races of both species and also from an isolate of *H. pedicillatum* from the same source.

2268 Wheeler, H. E. & Luke, H. H.
Mass screening for disease-resistant mutants in oats.
Science 1955 : **122** : p. 1229.

Details are given of a rapid method devised at the Department of Botany, Louisiana State University, for screening large populations for natural or induced mutants possessing resistance to *Helminthosporium victoriae*, using the toxin produced by this pathogen as the screening agent. Seedlings surviving toxin treatment were inoculated with *H. victoriae*. Plants surviving this test were inoculated with race 45 of crown rust and exposed to natural infection by other races of rust. Seed from plants showing moderate to high resistance was retained for further testing.

RYE

2269 Tedin, O.
Svalöfs Värneråg. (**The Svalöf rye Värne**).
Allmänna Svenska Utsädesaktiebolaget, Svalöf 1956 : p. 23.

Developed by the Swedish Seed Association from Kungs II [King's II] x Petkus, Värne equals Petkus II in straw strength but is superior in yield of grain and straw. It is particularly suitable for dry regions in south-east Sweden.

2270 Oehler, E.
Nouvelles voies dans la sélection du seigle. (**New approaches to rye breeding**).
Rev. rom. Agric. 1955 : **11** : 1–2; and Publ. Sta. féd. Ess. agric., Lausanne 1955 : No. 449 : Pp. 6.

In this account of the development of cultivated rye mention is made of the development of tetraploid varieties in Germany and Switzerland and of experiments carried out at the Federal Agricultural Research Station, Lausanne, on the possibility of exploiting heterosis in crosses between inbred lines of rye.

2271 Rédei, Gy., Vároczy, E. & Rédei, Gy.
A rozs állománykeresztezések kérdésének kísérletes vizsgálata. (**Experimental investigations on the problem of crossing rye populations**).
Növénytermelés 1954 : **3** : 181–202.

In experiments conducted at the Budapest Institute of Genetics, no evidence of selective fertilization was found when yellow-grained rye populations were exposed to open pollination by yellow and green-grained varieties. Among 274 single crosses involving 23 varieties, many hybrids exhibited heterosis with respect to seed weight, the average 1000-grain weight of all the hybrids being 4% greater than the mean of the parents.

At Martonvásár 60 hybrids showed an average increase in yield of 3% over the mean of 18 parental varieties and at Lovászpatona 73 hybrids displayed an increase of 7·5% over 12 parents; in each case the best hybrids yielded considerably more than standard Hungarian varieties.

2272 Borodin, I. T. & Stihin, M. F.
(**Achievements of Mičurinist agro-biological science**).
Zemledelie (Agriculture) 1955 : No. 10 : 57–61. [Russian].

Mention is made of new high-yielding and hardy varieties that have been bred at Vjatka, notably the rye Vjatka 2. This was obtained by intra-varietal pollination of Vjatka plants, which had been raised from the grain of different years and grown in diverse environments. It outyields the initial variety by 2–3 c. per ha.

2273 Price, S.
Desynaptic pseudoassociations in *Secale montanum*.
Science 1955 : **122** : p. 1190.

Bivalents and translocation configurations involving chromosomes associated along their entire lengths but connected only by terminal strands of matrix were observed throughout diakinesis in a plant obtained by pollinating an Iranian strain with X-irradiated pollen of the same strain. Desynapsis of these pseudo-associations resulted in univalents at metaphase I.

2274 Thompson, J. B. & Rees, H.
Selection for heterozygotes during inbreeding.
Nature, Lond. 1956 : **177** : 385–86.

In inbred families of rye studied at the Agricultural Research Council Unit of Biometrical Genetics, Birmingham University, England, genotypes heterozygous for one interchange (A) possessed a selective advantage over the homozygotes but genotypes heterozygous for another interchange (B) had no such advantage. Possibly the advantage of the A heterozygotes was due to a superior balance of polygenes.

2275 Rees, H. & Thompson, J. B.
Localisation of chromosome breakage at meiosis.
Heredity 1955 : **9** : 399–407.

Meiotic chromosomal abnormalities in the inbred rye line P13 are described and are shown to be attributable to B″ (chromosome) breakage, probably at pachytene, followed by a high percentage of sister reunion in both centrics and acentrics. About 5% of the breaks occur between the centromere and a chiasma or between two chiasmata and the resulting broken ends are visible at metaphase I; the remaining 95% are distal to chiasmata and are seen at anaphase. Breaks are localized mainly near the ends of the chromosomes and after such distal breakage and reunion terminalization of chiasmata at metaphase I is limited by the formation of lateral chiasmata. Crossing experiments indicated that the abnormality is controlled by more than one gene.

2276 Šandor, R.
(**Methods of improving vitality in rye**).
Izv. Timirjazev. seljskohozjaĭstv. Akad. (News Timirjazev agric. Acad.) 1955 : No. 2 : 135–44. [Russian].

At the Timirjazev Agricultural Academy the offspring of a rye variety varied in productiveness and vitality, depending on the mode of pollination. Plants obtained by fertilization with the pollen of the same variety which had been grown in altered environment outyielded the offspring of plants that had been selfed in the normal way. The reduction in yield of selfed material was partially offset by adding wheat pollen to self pollen. However, intervarietal hybrids surpassed all above material in yield, vitality and other economic characteristics.

2277 Karapetjan, V. K.
(**The vitality and fertility of rye plants raised from rye grains found in the ears of wheat**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 61–78. [Russian].

A previous report on the vitality of rye plants obtained by interspecific conversion mentioned forms which produced, even when emasculated and bagged, some viable seed (cf. *PBA*, XXIV, Abst. 217). Recent investigations of the second and third generations of these plants have shown that their vitality decreased as follows. The first generation of rye, developed from a rye grain found in the ear of wheat, set 2·2% grains; the second and third generations set 0·4% and 0·17% grains respectively. Analogous reductions in grain set of the second and third generations were observed in bagged but not emasculated material.

2278 Lundqvist, A.
A genetic analysis of self-sterility in rye, *Secale cereale* L.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 2–3.

A note is given reporting that self sterility appears to be determined by the combined action of two multiallelic systems; a fuller account of this work has already been summarized (cf. *PBA*, XXV, Abst. 984).

2279 Ključareva, M. V.
(**Cytoembryological investigations of the origin of forms with maternal inheritance in interspecific hybridization of cereals**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1955 : No. 6 : 34–50. [Russian].

The causes of maternal inheritance in the hybrids of rye ♀ x wheat ♂ have been studied at the Institute of Genetics of the Academy and the results are discussed in relation to Lysenko's theories of vigour and inheritance (cf. *PBA*, XXIII, Abst. 847). It was found that wheat pollen stimulated the growth of some of the ovules in emasculated florets of rye and caused changes in the structure of the nuclear elements within the embryo sac, especially the synergids. The contents of the synergids were emptied into the embryo sac, enveloped the egg cell and penetrated its cytoplasm and nucleus, thereby stimulating development of the egg cell into an embryo. The development of the egg cell may begin when it is either diploid or haploid. In the latter case diploidization occurs after the embryo has started developing. It is concluded that the forms with maternal characteristics arise because the embryo is produced without the fusion of male sex cells with those of the seed parent and that this occurs when external conditions are especially favourable for the development of the rye embryo.

2280 Fedorov, A. K.
(**Branching of ears in winter rye**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 144–49. [Russian].

By retarding the differentiation of the growth apices by various photoperiodic treatments and by ensuring an adequate flow of nutrients to stimulate growth the rye Timirjazevka was induced to form branched ears at the Institute of Genetics. The new character was transmitted to 52% of the progeny.

2281 Focke, R.
Über den Rohproteingehalt von *Secale cereale* und *Secale montanum* und den prozentualen Anteil einiger Aminosäuren. **(On the crude-protein content of *S. cereale* and *S. montanum* and the percentage proportion of some aminoacids).**
Züchter 1956 : **26** : 40–41.

Laboratory experiments at the University of Rostock, Germany, showed the crude protein content of *S. montanum* to be over twice that of *S. cereale*. The proportion of essential aminoacids (i.e. excluding arginine and histidine) was slightly lower in *S. montanum*. The F_1 of a cross between the two species produced grain with a protein content slightly lower than that of *S. montanum* and with a percentage of essential aminoacids a little above the mean of the two parents. It is concluded that a rise in protein content in rye is not as closely associated with a decrease in percentage of essential aminoacids as is the case with maize and that crosses of *S. montanum* with *S. cereale* offer a means of improving the nutritive value of the grain of rye.

MAIZE

2282 Maĭsuradze, N. I.
(Maize in Italy).
Dostižen. Nauk. pered. Opyt. seljsk. Hosjaĭstv. (Achiev. Sci. progr. Exp. Agric.) 1955 : No. 12 : 85–86. [Russian,]

A number of Italian varieties, suitable for cultivation on (*a*) poor and dry soils, (*b*) moderately rich moist soils and (*c*) rich moist soils, are briefly described.

2283 Mais, 1956. **(Maize, 1956).**
Landbouwvoorlichting 13 : Bijl. 6; Ber. Rassenkeuze 1956 : No. 203 : unpaginated.

Short descriptions are given of 12 Netherlands and American varieties and hybrids tested on different types of soil in the Netherlands in 1955. Matador, CIV2 (= Prior) and CB419 gave the highest yields in the early, medium early and medium late groups respectively. CB419 is described as a stiff-strawed hybrid producing large, round, red grains. The new late-maturing hybrid Caldera 402 also showed promise, especially on clay soils, and is well adapted to mechanical harvesting.

2284 Ozernyĭ, M. E.
(In concord with Mičurinist science).
Dostižen. Nauk. pered. Opyt. seljsk. Hozjaĭstv. (Achiev. Sci. progr. Exp. Agric.) 1955 : No. 10 : 31–35. [Russian].

The maize variety Partizanka [Partisan] (Sterling x Minnesota 23) is appreciably taller than its parent forms, its grain is larger and its ears weigh 410–540 g. each as compared with 180–200 g. in Sterling and 150–180 g. in Minnesota 23.

2285 Geroev, M. Ja.
(Maize cultivation in the north-eastern districts of Baškiria).
Zemledelie (Agriculture) 1955 : No. 12 : 27–29. [Russian].

The midseason type Voronež 76 produced more grain at the milky or waxy stage of ripeness than all other varieties tested at the Duvan field research station and its yield of green matter was higher than that of other midseason or early varieties.

2286 Pljusnin, A. T. & Orobčenko, V. P.
(Experiments on maize cultivation in the province of Žitomir).
Zemledelie (Agriculture) 1955 : No. 12 : 30–32. [Russian].

Among varieties with good grain yields, mention is made of Krasnyĭ Sterženj [Red Rachis], from the Cartoriĭskoe field research station, which outyields Severo-Dakotskaja Belaja [White North Dakota], Voronež 76 and Harjkov 23. It produces large cobs and has a short growth period. It was obtained by hybridization involving low-yielding early Ukrainian varieties and midseason varieties notable for high yields.

2287 Furza, N. T., Kalugin, M. I. & Homenko, A. A.
(An experiment on growing maize in the Kulunda steppe).
Zemledelie (Agriculture) 1955 : No. 12 : 22–26. [Russian].

Gibrid Donskoĭ [Don Hybrid] from Rostov surpassed all introduced material tested at Slavgorod, Altaĭ territory, in earliness. In a season with ample rainfall it produced more grain and forage than the early Siberian varieties Slavgorod 270 and Urožaĭnaja [Productive] but under drought conditions its grain yield was below theirs though it exceeded that of all other varieties.

2288 Shams-ul-Islam Khan
Theoretical aspects of crossing over in $T_{5\text{-}6c}$ in corn, *Zea mays* L.
Cellule 1954 : **56** : 309–27.

A new method of measuring cross over values by assessing the degree of translocation between chromosome 6 and any other chromosome is described. Chromosome 6 is assumed to be associated with the nucleolus by virtue of its organizer. In the absence of the organizer the nucleolar material remains dispersed and does not organize itself into a nucleolus; consequently a nucleolus will be organized in each cell of the quartet only if each receives an organizer. Cross-over and non-cross-over quartet types differ in their nucleolar organization in that the former has a nucleolus in each of three cells but none in the fourth whereas the latter has either one nucleolus in each cell or two in each of two adjacent cells and two cells with dispersed nucleolar material.

It is claimed that the method described has two principal advantages. Firstly, the expected cross-over values can be calculated from the cross-over distance, and compared with the observed values. Secondly, from counts of the cross-over and non-cross-over quartet types, the frequency of pollen abortion can be calculated and used to verify or disprove the accuracy of the observed values.

Using the technique described above, nine different quartet types, based on the cross-over frequency between chromosomes 5 and 6, were calculated. Cross-over frequency and extent of pollen abortion were evaluated at different levels of interference.

2289 Shams-ul-Islam Khan

Effect of temperature on crossing-over in heterozygous $T_{5\text{–}6c}$ with normal chromosome 5 in maize.

Beitr. Biol. Pfl. 1956 : **32** : 171–183.

Exposure of three heterozygous maize stocks, in which crossing-over values could be determined by the method described in Abst. 2288, to 36 ± 2° F. for 1–7 consecutive days during the first eight weeks of seedling growth, resulted in an increase from the normal crossing-over value of 54·6% to a maximum of 63·1%, the temperature effect being greatest in material treated in the fifth or sixth week after germination and the most effective duration of treatment 4–6 days. Percentages of pollen abortion calculated from crossing-over data agreed closely with observed values. Exposure to cold treatments for 24 hours 10–20 days after pollination or for 15 days just before or just after germination gave only slight increases in crossing over, and exposure of seedlings to 50 ± 2° F. was without effect. It is suggested that low temperature exerts its influence on crossing over by increasing the interference.

2290 Mancini, E.

Il reincrocio e il suo impiego nel miglioramento delle linee inbred di mais. (**The back cross and its use in the improvement of maize inbred lines**).

Sementi elette 1955 : **1** : No. 1 : 14–22.

The principle of recurrent back crossing is explained and illustrated by examples, which include the transference of yellow endosperm to a white line of maize and *vice versa*, and the introduction of male sterility and various resistances to the inbreds used for the production of commercial seed.

2291 Brandolini, A.

Insubria 521.

Maydica, Bergamo 1956 : **1** : 17–21.

Insubria 521 is the first of the maize hybrids produced in Italy by crossing dent lines from the USA with flint lines isolated from Italian varieties. Its parentage is (WF9 x 38–11) x (Lo3xLo32), the two first-named being inbreds from Reid Yellow Dent and Funk 176A and the two last-named inbreds from Nostrano dell'Isola and Isola basso respectively. The hybrid is semident but equal to the dent hybrids in vigour, and over the three-year period 1953–55 it yielded 5·5–7·3% more grain than the hybrid Wisc. 641AA, 35·5% more than Nostrano dell'Isola and 56·2% more than the open-pollinated variety used as standard in southern Italy; its best yields have been 106, 109·12 and 117·8 c. per ha.

2292 Verso i 200 q.li di granoturco per ettaro? (**Towards 200 quintals of maize per hectare ?**)

G. Agric. Domen. 1956 : **66** : p. 11.

Figures are given showing that in the Italian province of Brescia the average yield of maize has risen from 34 c. to 62 c. per ha. since 1948 as a result of the introduction of hybrid maize. Under good conditions yields of over 188 c. per ha. have been produced and it is thought that the goal of 200 c. is not unattainable.

2293 Baranov, P. A., Dubinin, N. P. & Hadžinov, M. I.

(**The problem of hybrid maize**).

Bot. Ž. (Bot. J.) Moskva 1955 : **40** : 481–507. [Russian].

Production of hybrid maize in the USSR and other countries is discussed and the achievements of American research on double-cross hybrids are extolled. The USSR is said to lag behind, because this kind of work has been suspended since 1935. Various administrative measures designed to improve Soviet production of maize inbreds, together with a scheme for seed growing of double-cross hybrids, are put forward. The practical work should be supplemented by research in genetics, especially on the use of cytoplasmic male sterility for the production of hybrid seed and on haploid parthenogenesis for the development of homozygous lines. The problem of maintaining heterosis should be investigated and good results may be obtained by polyploidy or by induction of structural heterozygosis by means of irradiation of the chromosomes. Brief mention is made of some Russian research along these lines.

2294 BALJURA, V. I.
(What the experiment on growing maize in the Nonchernozem Belt in 1955 has taught us).
Zemledelie (Agriculture) 1955 : No. 12 : 7–21. [Russian].

Mention is made of new productive forage types from Nemčinovka, obtained by crossing early Siberian with tall southern varieties such as Partisan or Minnesota 13 Extra. In the Nonchernozem Belt the hybrids have a greater forage value than the late southern varieties and yield a higher proportion of grain.

2295 MOŞNEAGĂ, V. *ET AL.*
Perspective pentru sporirea producţiei de porumb în Republica Populară Romînă prin folosirea seminţei hibride. (**Prospects for increasing the production of maize in the Rumanian People's Republic by utilizing hybrid seed**).
Bul. Şti. Secţ. Şti. Biol. Agron. Geol. Geogr. 1954 : **6** : 135–60.

Yield increases of *ca.* 10–20% have resulted from the introduction of intervarietal hybrids. The following are described: Dobrogea x L. Phister*, Dobrogea x ICAR54, Romînesc de Studina [Studina Rumanian] x L. Phister, Romînesc de Studina x ICAR54, Portocaliu de Tg. Frumos [Tîrgu Frumos Orange] x L. Phister, Portocaliu de Tg. Frumos x ICAR54, Galben timpuriu [Early Yellow] x Portocaliu de Tg. Frumos and Hîngănesc x Portocaliu de Tg. Frumos.

2296 GHOSH, A. K., DEY, N. S. R. N., SINGH, G. D., SISODIA, U. S. & DUNGAN, G. H.
Report of the agronomy department for 1954-55.
Allahabad Fmr. 1955 : **29** : 115–41.

The investigations referred to include continued work on the production of hybrid maize. In field tests, the best hybrids gave higher yields of grain than the highest yielding open-pollinated varieties, especially in the winter season.

2297 **Maize breeding.**
Nyasald. Fmr. For. 1955 : **3** : No. 1 : p. 32.

The results of yield trials of single crosses in Nyasaland suggested that the development of double hybrids and synthetics from local maize should be possible within a few years. Sources of resistance to *Helminthosporium turcicum* and *Puccinia polysora* are being sought. A representative collection of maize in the Protectorate was made for use in breeding.

2298 DEL VALLE, C. G.
Híbridos de maíz de la Estación Experimental Agronómica. (**Maize hybrids of the Agronomic Experimental Station**).
Bol. Estac. exp. agron. Cuba 1953 : No. 70 : Pp. 27.

The hybrid Cuba M–11 (cf. *PBA*, XXIII, Abst. 1153) combined the high yielding capacity of the dent corns with the quality of the flints and is described, together with two new hybrids, Cuba M–12 and Cuba M–13. The last-named is a dent hybrid and yielded 83–33 c. of grain per ha. in 1952–53, as against 72·95 c. from M–11 and 48·97 from the open-pollinated variety Francisco; M–12, which is a flint hybrid, yielded 70·17 c. When tested in Florida, both M–11 and M–13 outyielded Funk G–715 and other hybrids and varieties tested with it and M–12 took fourth place immediately after Funk G–715. Cuba M–11 has given record yields also in Nicaragua, giving 26% more than (MS)6 and 59% more than Venezuela 3; in Indonesia it has outyielded all other varieties with which it was compared in nearly all tests and in Bali for instance gave yields just twice as high as those of the local varieties; it has also beaten all other varieties in Panama.

The principles of seed production and certification for hybrid maize are explained and a brief outline is given of work with hybrid corn now in progress in other tropical countries of Latin America.

2299 Mais ibridi costituiti dalla Agricultural Experiment Station dell'Università del Wisconsin, Madison, Wisc. (**Maize hybrids produced by the Agricultural Experiment Station of the University of Wisconsin, Madison, Wis.**).
Maydica, Bergamo 1956 : **1** : 23–24.

A list is given of the main Wisconsin hybrids and their parentage.

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* ? L. Pfister.

2300 Menezes, O. B. de
Comportamento de combinações híbridas simples, complexas e sinteticas do milho (*Zea mays L.*). [**Behaviour of simple, complex and synthetic hybrid combinations of maize (*Z. mays* L.)**].
Bol. Inst. Ecol. Exp. agríc. 1952 : No. 9 : Pp. 27.

The performance in Brazil of all possible double crosses, 3-way crosses and synthetic varieties involving the nine unrelated inbreds A396, A375, A334, Ohio S1A, Illinois 4226, A25, A71, Os 420 and KB397 was predicted from the performance of 36 single crosses. It was also predicted that the best 3-way crosses would not differ significantly from the best actual single cross. Several 3-way crosses would be expected to be superior to the best double crosses, which, in turn, would be expected to perform better than most of the synthetics. It was predicted, however, that some synthetics involving 3 or 5 lines would be superior to the double-cross checks.

2301 Fenaroli, L.
L'uso della sterilità maschile nella produzione delle sementi ibride di mais. (**The use of male sterility in the production of hybrid seed of maize**).
Maydica, Bergamo 1956 : **1** : 6–11.

A brief explanation is presented of the respective advantages of male sterility conditioned by the genes *S*, *T* and *Kys*, with the suggestion that under present conditions in Italy their adoption for the production of commercial seed would hardly be economic.

2302 Popow, G.
Anbauversuche mit Maishybriden verschiedener Provenienz. (**Cultivation experiments with maize hybrids of different provenance**).
Mitt. schweiz. Landw. 1956 : **4** : 13–16.

Field trials in Switzerland have shown that imported commercial seed of Ohio M34, Wisconsin 255, Orla 266 and Wisconsin 270 tends to be less reliable as regards yield, varietal purity and maturity than seed of the same hybrids produced locally.

2303 Nickerson, N. H. & Dale, E. E.
Tassel modifications in *Zea mays*.
Ann. Mo. bot. Gdn. 1955 : **42** : 195–212.

Descriptions are given of the tassels and ears of the following mutants: 9 "tassel-seeded" forms (ts_1, ts_2, Ts_3, ts_4, ts_4^a, Ts_5, Ts_6, ts_7 and ts_8); male sterile (ms_1); branched silkless (*bd*); club (*club*); vestigial glume (*Vg*); tunicate (*Tu*); *ramosa*-1 (ra_1); and *ramosa*-2 (ra_2). For the purpose of significant comparison, each genetic form was introduced into a standard background derived from the inbreds CC5 and L317.

2304 Stein, O. L.
Rates of leaf initiation in two mutants of *Zea mays*, dwarf-1 and brachytic-2.
Amer. J. Bot. 1955 : **42** : 885–92.

This is a detailed account of the work already reported in Abst. 373.

2305 Musiiko [Musiĭko], A. S.
Soiuri noi de porumb pentru insilozare. (**New varieties of maize for silage**).
An. Romîno-Soviet. 1955 : **9** : Ser. Agric. : 103–07.

The Russian paper from which this version was translated was summarized in *PBA*, XXV, Abst. 1036.

2306 **New world corn origin proved.**
Seed World 1955 : **77** : No. 6 : p. 41.

Mention is made of the discovery of fossilized maize pollen 60,000 years old below Mexico City by botanists of Harvard University.

2307 Mesa Bernal, D.
¿De dónde es originario el maíz? V. VI. (**Where did maize originate ? V. VI**).
Agricultura trop. 1955 : **11** : 941–46; 1956 : **12** : 87–90.

In part V (cf. Abst. 1253) the argument that the original pod corn arose among the Guaraní Indians of Paraguay is examined and certain points against the argument are presented. It is pointed out that the expression *aba* to denote maize is common to the Guaraní language of Paraguay and the Chibcha of Colombia and Central America and may have been imported in either direction; and that the expression *pisingallo* to denote popcorn is not known in the Antioquia department of Colombia; it is a Quechua word and probably introduced into the Paraguay region from the Quechua-speaking areas.

Citations in part VI show that the maize found in Colombia and Venezuela was early-maturing and of the popcorn type, both these being considered as primitive characters.

2308 Zohary, D.
Chiasmata in a pericentric inversion in *Zea mays*.
Genetics 1955 : **40** : 874–77.

The occurrence of open reversed inversion chiasmata and of inversion asymmetry at diakinesis in a plant heterozygous for a pericentric inversion indicates that, in maize, crossing over leads to the formation of a chiasma.

2309 SHAMS-UL-ISLAM, KHAN.
Effect of temperature on crossing-over in heterozygous T_{5-6c} with homozygous inversion in chromosome 5 in maize.
Cytologia, Tokyo 1955 : **20** : 150–56.

At ordinary temperatures, ratios of 2 : 3 and 3 : 2 for frequencies of rings to chains were obtained for heterozygous T_{5-6c} stocks with and without a homozygous inversion in chromosome 5 (cf. Abst. 2288). Inversion was associated with 1% and 1·5% 3 : 1 disjunction in the field and greenhouse respectively, whereas no 3 : 1 disjunction was detected in T_{5-6c} stocks involving normal chromosome 5.

Exposure of T_{5-6c} plants with the homozygous inversion to 36 ± 2° F. caused an increase in cross-over frequency compared with the control plants, the highest increase in frequency, 12·9%, being obtained with treatment at the age of 5 weeks. It is suggested that low temperature influenced interference.

2310 LONGLEY, A. E.
The origin of diminutive B-type chromosomes in maize.
Amer. J. Bot. 1956 : **43** : 18–22.

Diminutive B chromosomes may originate in two ways: by exchanges in spatially separate regions of a normal B chromosome and by exchanges between the two sections of the B-chromosome component of translocation B–9a. Initiation of the exchanges is attributed to the presence of a large segment of modified heterochromatin in the B chromosome.

2311 TAVČAR, A.
Heritable proliferation of tassels and viviparism in *Zea mays* L. and its cytological basis.
Bull. Sci. Cons. Acad. Jugosl. 1955 : **2** : 84–85. (Abst.).

A stock with hereditary proliferation of the tassels, decussate leaves, and producing viviparous offspring is described. Obtained at the Institute of Plant Breeding and Genetics, Zagreb, by inbreeding a spontaneous mutant found in 1931, the viviparous plants display marked semisterility of both the ovule and pollen but can be easily propagated by breaking off the shoots found growing on the tassel itself. Crosses with ordinary maize plants showed proliferation to be dominant. In meiotic studies of the mutant stock 10 pairs of chromosomes were observed at diakinesis. Up to 12 univalents, most of which were ellipsoid in shape, were noted at metaphase I. The univalents are thought to arise as the result of breakage at the centromeres.

2312 ZAHAROVA, G. M. & TOVMASJAN, O. V.
(The problem of selective fertilization in plants).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 79–82. [Russian].

Different behaviour of the maize varieties Kirgizskaja Belaja [White Kirgiz], Risovaja Belaja [White Rice] and Rumynskaja Belaja 9 [White Rumanian 9] when open pollinated with some varieties with coloured grain is reported from the Institute of Genetics. Kirgizskaja Belaja was characterized by a high percentage of xenia. The others produced mostly grain of the seed-parent type, although it was larger than normal for these varieties. The improvement in the size of grain is attributed to the participation of foreign pollen in fertilization.

2313 USTINOVA, E. I.
(Some problems concerning fertilization of maize).
Agrobiologija (Agrobiology) 1955 : No. 6 : 74–84. [Russian].

The biology of fertilization of such varieties as Voronež 76, Čišminskaja and Bezenčuk was studied at Moscow University and the results are summed up as follows. The pollen grows at any point along the stigma, the growth being more intensive at the basal end.

For fertilization to be effective the number of pollen grains that alight on the stigma should be appreciably larger than that of ovules; supplementary pollination is recommended if flowering coincides with bad weather.

The stigmas remain viable for 15–18 days. All growing pollen tubes participate in fertilization. Some penetrate the embryo sac, others empty their contents into the tissues surrounding the ovule and may cause metaxenia or telegony.

2314 NEWLIN, O. J.
Inheritance of fertility restoration in cytoplasmic male-sterile *Zea mays*.
Diss. Abstr. 1955 : **15** : Publ. No. 13,340 : p. 1478. (Abst.).

Inbred A293 apparently possesses the genotype *RRPP* with respect to the ability to restore fertility to crosses with inbred $B8^T$, the cytoplasmic male sterility of which was derived from the Texas source. The genotype of $B8^T$ is postulated as *rrPP*. Inbred A73 is incapable of counteracting the sterility of $B8^T$. Restoration of fertility to $A158^S$, an inbred with male sterility from another source, was evidently influenced by the interaction of modifiers and environmental conditions.

2315 GENTER, C. F., EHEART, J. F. & LINKOUS, W. N.
Effects of location, hybrid, fertilizer, and rate of planting on the oil and protein contents of corn grain.
Agron. J. 1956 : **48** : 63–67.

In tests of the maize hybrids NC 1032, US 262, US 357, Ind. 750, Ky. 203, Funk G 515W and Pioneer 510 in several localities in Virginia, genotype had a considerably greater effect upon variability in oil content than environmental conditions but in the case of protein content genetic effects were of secondary importance.

2316 LEVANOVA, T. A.
(**The morphogenesis of the male and female inflorescences in maize**).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1955 : **16** : 486–97. [Russian].

At Harjkov forms with short growth periods, for instance the variety Sibirjačka [Siberian Dweller] and the F_1 of Sibirjačka x Sterling, were distinguished from late varieties and hybrids by early differentiation of the tassels and axillary buds and by a quicker rate of tassel and ear formation.

2317 BLANCO GONZÁLEZ, M., VEIGUINHA, A. S. & BLANCO GONZÁLEZ, J. L.
La selección de líneas de maíz de "tallos azucarados" y el rendimiento de sus híbridos, en relación al doble aprovechamiento de su grano y sus plantas. Resultados de los estudios realizados dés 1951 hasta 1954. (**Selection of maize lines with sweet stems and the yield of their hybrids, in relation to the dual use of the grain and plants. Results of studies made from 1951 to 1954**).
Agron. lusit. 1955 : **17** : 61–86.

Refractometric readings were made of the juice of Connecticut inbreds with high sucrose content of the mature stem (cf. *PBA*, XXIII, Absts. 1169 and 1933) and of a large number of selfed lines from Spanish maize varieties; the individuals giving the highest readings were selected in three successive years. Considerable increases were effected in this way and some of the Spanish lines gave values of 12 to 21%, whereas the Connecticut lines were all below 9%. The results of crossing lines differing in value showed the high values to be in most cases recessive to the low. The hybrids were grown in two different places in Spain and one in Portugal and their yields recorded. Some of the hybrids remained green for six weeks after the grain had ripened and being extremely resistant to lodging are considered of great practical value for ensilage. By expressing and fermenting the juice it was possible to produce alcohol at the rate of 550 litres per ha. from the hybrids after their grain had been harvested; the best of the hybrids produced up to 960 litres per ha., with a grain yield of 13·726 kg.

2318 HUBER, L. L.
Pennsylvania corn performance studies—1954.
Progr. Rep. Pa. agric. Exp. Sta. 1955 : No. 137 : Pp. 12.

The results of tests on double hybrids at different centres in Pennsylvania are summarized and discussed with reference to the effects of environment, particularly lack of water.

2319 KOZUBENKO, V. E.
(**Breeding maize with two ears**).
Zemledelie (Agriculture) 1955 : No. 12 : 58–64. [Russian].

This article discusses the relations between yield and ear number per plant and ear number and drought resistance and refers to research on dents at the Černovcy research station, the Kubanj branch station of the Institute of Oil Plants and the Institute of Plant Industry. Grain yield and ear number were positively correlated. It was found that in moist years the yield of the two-eared plants was caused by higher ear weight and in dry seasons by the greater number of ears per plant. Forms with more than one ear have invariably outyielded those with one ear, the difference in productivity being more noticeable in dry than moist years. A description is given of Zubovidnaja 3135 [Dent 3135] selected for two ears from Minnesota 13 Extra. It is drought resistant and outyields Harjkov 23, Dnepropetrovskaja and a number of other varieties and hybrids in the Krasnodar and Stavropolj territories and in the Černovcy and Stanislav provinces.

Breeding work on inbred lines with two ears is advocated. In this connexion mention is made of an inbred VIR 44 [Plant Industry 44] which tends to produce plants with two ears. Two lines, the one bearing two ears on each plant and the other one ear, were selected from a single ear of VIR 44 and then crossed with Voronež 76. The yield of the line with two ears was 232 g. per plant and of the other 160 g. per plant.

2320 Hoppe, P. E.
Cold testing seed corn by the rolled towel method.
Bull. Wis. agric. Exp. Sta. 1955 : No. 507 : Pp. 5.

Details are given of the above technique of testing germination of maize seed at low temperatures. A layer of soil and the kernels are placed between moist paper towels. The assemblage is then rolled into a "doll" and placed in a rust-proof container with a capacity for not more than 21 dolls. After being kept 6–10 days at 48–50° F. in a refrigerator, the dolls are transferred to a warm room, observations on germination being made 3 days later. The test is suitable for evaluating inbreds and hybrids for seed-rot resistance.

2321 Hooker, A. L.
Intra-inbred line variation in resistance to a *Pythium* seedling disease of corn.
Agron. J. 1955 : **47** : 580–85.

Heritable differences in reaction to *Pythium* species were found among individual ears within five inbred strains of dent corn. Further differences in reaction within the progenies of individual ears were significant but not heritable.

2322 Harvey, P. H., Thompson, D. L. & Hebert, T. T.
Reaction of inbred lines of corn to brown spot.
Plant Dis. Reptr. 1955 : **39** : 973–76.

In artificial-inoculation tests under field conditions in North Carolina, 32 inbreds showed a sufficiently high degree of resistance to brown spot (*Physoderma maydis*) for breeding purposes. NC42 and GT54 were the most resistant, showing only a trace of infection in each year.

2323 **Hybrid maize variety resistant to head smut.**
Agric. Gaz. NSW 1955 : **66** : p. 614.

The hybrid Emblem remained completely free from head smut during a severe outbreak of this disease in the Richmond district, NSW, whereas the hybrid Victory was severely attacked.

2324 Waterhouse, W. L.
Australian rust studies XIV. Investigations of rust of maize caused by *Puccinia sorghi* Schw.
Proc. Linn. Soc. NSW 1955 : **80** : 138–41.

At the University of Sydney, five ecidial and seven uredospore cultures of *P. sorghi* from different districts of New South Wales and Queensland were used in a comparative study of the reactions of lines of inbred maize from Australia and the USA. No evidence of specialization was obtained. An inbred line of Golden Glow 208, from Minnesota, was the only strain resistant at the seedling stage, although a number of other inbreds proved resistant at the adult-plant stage. Crosses of Golden Glow 208 with susceptible varieties showed that resistance at the seedling stage depends upon a single dominant gene; it is thought that little difficulty will be experienced in transferring this type of resistance to other commercial types.

BARLEY

2325 Fröier, K.
Aktuella förädlingsuppgifter i samband med den ökade kornodlingen. (**Current breeding information in connexion with the increase in barley cultivation**).
Allmänna Svenska Utsädesaktiebolaget, Svalöf 1956 : 12–16.

The agronomic characteristics required in different parts of Sweden are described and varieties with the requisite qualities are noted.

2326 **Parkland, new malting barley variety, approved by plant breeding authorities.**
Canad. Grain J. 1956 : **12** : No. 2 : p. 28.

Developed at the Brandon Experimental Farm, Man., Parkland has consistently outyielded OAC21 and Montcalm in western Canada; it has in addition given good yields in many parts of eastern Canada. It is superior to Montcalm in straw strength, bushel weight and stem-rust resistance. Its pedigree involves Montcalm, OAC21, Olli, Peatland and Newal. The variety is to be distributed in 1957.

2327 Gotoh [Goto], K.
Genetic analysis of varietal differentiation in cereals. I. Statistical differences found among local strains of a barley variety, "Hosogara No. 2".
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 95–106.

Six samples of the above variety, released some 30 years ago by the Aomori Agricultural Experimental Station, and grown in different regions of Japan, were compared in respect of heading date and a series of quantitative morphological characters. Considerable differences between the samples were noted and some of the samples gave heterotic offspring when intercrossed.

2328 GOTOH, K.
Genetic analysis of varietal differentiation in cereals. II. Various growth habits in local strains of the barley variety "Hosogara No. 2".
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 197–205.

In continuation of the investigations summarized in Abst. 2327, the author describes variability in the variety Hosogara 2 in respect of auricle length; presence (*Hs*) or absence (*hs*) of hairs on the leaf sheath; long (*S*) or short (*s*) rachilla hairs; spring, alternative or winter habit; and heading date. In one sample correlation coefficients between heading date, on the one hand, and ear length, spike density and grain size, on the other, were respectively + 0·5323, + 0·5173 and − 0·3838.

2329 WHEATLEY, G. W.
Linkage relationships in group IV in barley.
Abstr. Thes. Utah St. Agric. Coll. 1955 : **3** : No. **3** : 15–16.

The factor pairs found to show linkage were as follows: *Blbl* and *Kk*, 35·5 ± 1·9%; *Blbl* and *Zz*, 38·0 ± 2·5%; *Blbl* and *Glgl*, 33·0 ± 2·2%; *Kk* and *Glgl*, 25·5 ± 1·9%; *Kk* and *Zz*, 27·0 ± 4·6% in two crosses; and *Kk* and *Zz*, 35·5 ± 3·8% in three crosses. The order *Z K Gl Bl* is proposed. Rb was independent of *Bl*, *Z*, *Gs* and *L*. The characters determined by the genes referred to are not specified.

2330 ADAMS, J. D., NILAN, R. A. & GUNTHARDT, H. M.
After-effects of ionizing radiation in barley. I. Modification by storage of X-rayed seeds in oxygen and nitrogen. A preliminary report.
Northw. Sci. 1955 : **29** : 101–08.

Storage of dormant seeds of the barley Himalaya for 2 to 8 weeks after X irradiation resulted in an increased frequency of chromosome bridges and decreased viability, compared with the irradiated controls. Evidence was obtained suggesting that these effects were enhanced by storage in oxygen but lessened by storage in nitrogen.

2331 MECHELKE, F.
Temperaturbedingte Chromosomensegmentierung bei Sommer- und Wintergersten. (**Temperature-conditioned chromosome segmentation in spring and winter barleys**).
Kulturpflanze, Berlin 1955 : **3** : 127–35.

Seeds of the cultivated varieties *Hordeum vulgare* var. *nutans* 'Heines Haisa' and *H. vulgare* var. *hybernum* 'Friedrichswerther Berg' and the primitive forms *H. agriocrithon* and *H. spontaneum* were subjected to temperatures of 1–3° C. prior to germination and cytological studies were then made of the root-tip cells of the germinating seeds. Special terminal segments and constrictions were observed at metaphase in the short arm of chromosome VII of the two spring forms Heines Haisa and *H. agriocrithon* only. It is postulated that the short arm of chromosome VII of spring barleys possesses a very short heterochromatic segment which behaves in a negatively heteropycnotic manner under conditions of low temperature and further that the heterochromatin of spring barleys differs, either quantitatively or in its chemical composition, from that of winter barleys. The possible relationship between the heterochromatin of the short arm of chromosome VII and the physiological development of winter and spring barleys is discussed briefly.

2332 KUMP, M.
The hereditary phenomen of double ears in two-rowed naked winter barley *Hordeum distichum nudum*.
Rev. sci. agric., Zagreb 1953 : **15** : 11–25. [Bull. Sci. Cons. Acad. Jugosl. 1955 : **2** : p. 94. (Abst.)].

Observations at the Institute of Plant Breeding and Genetics, Zagreb, on two-rowed naked winter barleys producing two completely separated ears (as opposed to branched ears) on the same stalk led to the conclusion that this characteristic is a hereditary phenomenon capable of being strongly modified by external environmental conditions.

2333 SCHOLZ, F.
Mutationsversuche an Kulturpflanzen. IV. Über den züchterischen Wert zweier röntgeninduzierter nacktkörniger Gerstenmutanten. (**Mutation experiments on crop plants. IV. On the value of two X-ray induced naked barley mutants for breeding purposes**).
Kulturpflanze, Berlin 1955 : **3** : 69–89.

The naked mutants 4129 and 3041/6a, selected from plants grown from X-irradiated seeds of the varieties Haisa and Donaria respectively (cf. *PBA*, XXII, Abst. 1909), were found to be identical with the parent strains in all other morphological characters. Yields obtained from mutant 4129 were slightly higher than those from Haisa; mutant 3041/6a yielded slightly less than Donaria. Crosses with the parent varieties showed that nakedness depended upon a single recessive gene, designated *n*; this gene does not appear to have a pleiotropic effect or to be linked with any gene conferring unfavourable characteristics. Crosses between the mutants and naked barleys from the Gatersleben world collection indicated that the gene for nakedness in the mutants is the same as that found in all other naked forms. It is hoped to incorporate the gene for nakedness from the two mutant lines into other high-yielding varieties; Haisa and Donaria no longer rank among the most productive German varieties and it is consequently unlikely that the mutant lines themselves will be grown on a large scale.

2334 Williams, D. O.
The selection of barley for brewing.
Brew. Guild J. 1956 : **42** : No. 495 : 13–40.

The agronomic and malting qualities required in a good malting barley are described and an account is given of the origin and history of some of the most important malting barleys used in Great Britain and Ireland since 1900. Beorna (Spratt-Archer x Kenia), a high-yielding stiff-strawed variety recently developed at the Ballinacurra Cereal Station, Eire, has proved equal or superior to Spratt-Archer in malting and brewing quality. An X-ray induced mutant which, in spite of its low yield, is likely to be of breeding value because of the high malting quality apparently associated with round grain and a low proportion of husk has been produced at the same station. Illustrations showing the characteristic features of different grain types are provided and the paper concludes with a brief survey of methods of predicting malting quality from chemical and other characteristics of the grain.

2335 Villena, L. M.
La indentificación de "cultivars" en cebada. (**The identification of cultivars in barley**).
An. Estac. exp. Aula Dei 1955 : **4** : 1–148.

The value for taxonomic purposes of various characters of the growing plant, ear, awns, floral organs and grain is examined and a key is presented for the identification of Spanish cultivars of *Hordeum vulgare*, followed by brief descriptions of the cultivars arranged in alphabetical order.

2336 Zweifel, J. & Keller, C.
L'orge d'automne Dea. (**The winter barley Dea**).
Rev. rom. Agric. 1955 : **11** : 59–61; also Publ. Sta. féd. essais agric. Lausanne 1955 : No. 471 : Pp. 7.

The winter barley Dea, recently included in the Swiss Official Collection, is described. It was obtained from the back cross (Ragusa x Peragis 12) x Ragusa at the Weihenstephan Plant Breeding Institute, Bavaria, and when compared with Riniken and Bordia in trials at the Federal Agricultural Research Station, Zürich-Oerlikon, gave higher yields of grain, tillered more profusely, was less susceptible to *Erysiphe graminis* in the adult plant stage and was more resistant to lodging than either of these two varieties. Its straw yields and overwintering properties were satisfactory. It matured slightly earlier than Bordia but later than Riniken.

2337 Nover, I. & Mansfeld, R.
Resistenzeigenschaften im Gersten- und Weizensortiment Gatersleben. I. Prüfung von Sommergersten auf ihr Verhalten gegen *Erysiphe graminis* DC. f. sp. *hordei* Marchal. (**Resistance characteristics in the Gatersleben barley and wheat collection. I. Testing spring barleys for their reaction to *E. graminis* DC f. sp. *hordei* Marchal**).
Kulturpflanze, Berlin 1955 : **3** : 105–13.

Tabulated data are presented on the reaction of 720 barley varieties and land races included in the Gatersleben World Collection to artificial infection in the greenhouse with the four most prevalent races of *E. graminis* f. *hordei* found in Germany. Only 23 of the barleys were resistant in the juvenile stage to artificial infection with all four races; some of these varieties later proved susceptible in the adult plant stage when grown in the field. Among varieties suggested as being of possible value in breeding for resistance to *E. graminis* are Algerian CI1179, Sulu CI1022 and Weider CI1021. The first of these three varieties is susceptible to *Puccinia simplex* but the other two combine resistance to *E. graminis*, *P. simplex* and *P. glumarum*. It was noted that the resistance of a given variety remained constant irrespective of the climatic or geographical conditions under which it was grown.

2338 Moseman, J. G.
Sources of resistance to powdery mildew of barley.
Plant Dis. Reptr. 1955 : **39** : 967–72.

Information is given on the seedling reactions of 120 barleys to 8 races of powdery mildew (*Erysiphe graminis* var. *hordei*). The majority of these barleys are the most mildew-resistant among the world collection in the USA, and chiefly consist of spring types from India, France and Germany, and winter barleys from Germany. Varieties known to possess a gene for resistance to California race 3 or outstanding resistance in field tests were crossed with one or more of the adapted varieties Manchuria, Randolph and Reno. Progenies homozygous for resistance to California race 3 are now being back-crossed to the adapted varieties.

2339 PODHRADSZKY, J. & KIRÁLY, Z.
Az *Ustilago nigra* Tapke (árpa fekete pörüszög) előfordulása Magyarországon. [**The occurrence of *U. nigra* Tapke (black smut of barley) in Hungary**].
Növénytermelés 1954 : **3** : 123–28.

The occurrence of *U. nigra* in southern Hungary is reported. Samples of *U. hordei*, known to be uncontaminated, have been found to contain both smooth and rough spores, suggesting that natural hybridization may have occurred between this species and *U. nigra*.

2340 SHANDS, R. G.
Inheritance of covered smut resistance in two barley crosses.
Agron. J. 1956 : **48** : 81–86.

The resistance of Brachytic to race 6 of *Ustilago hordei* depended upon a simple dominant factor (*Uh*) in crosses with the susceptible varieties Chevron and Colsess. Resistance was inherited independently of *Nn* (hulled *vs.* naked condition), *Kk* (hooded *vs.* awned condition), *Ss* (long *vs.* short haired rachilla), *Brbr* (normal *vs.* brachytic growth) and *Tt* (resistance *vs.* susceptibility to stem rust). Inoculated seed giving rise to resistant and segregating F_3 progenies produced more plants which reached a classifiable stage with respect to covered-smut reaction than seed of the corresponding susceptible progenies.

2341 VALLEGA, J. *ET AL.*
Comportamiento de algunas cebadas con respecto a la raza 14 de *Puccinia hordei* Otth. (**Behaviour of some barleys with respect to race 14 of *P. hordei* Otth**).
Rev. Invest. agríc. B. Aires 1955 : **9** : 187–200.

Collections from a wide range of sources in Argentina have all been identified as race UN14 and some 5000 varieties, comprising the world collection of the US Department of Agriculture, have been tested for their reaction to it. Varieties that proved resistant under both field conditions and in the greenhouse are enumerated; some of them possess resistance to other diseases too, such as *Helminthosporium teres*, *Erysiphe graminis* and *Rhyncosporium secalis*. The varieties considered most promising for breeding are Abyssinian (CI1243), Arequipa, Bolivia (CI1257), Quinn (CI1024), Peruvian (CI1935) and Spanische (CI6313). The Argentine variety FAV19 has displayed promising resistance in the field and certain other Argentine selections have shown low percentages of attack.

MILLETS AND SORGHUMS

2342 JONES, K. W.
Further experiments on witchweed control. II. The existence of physiological strains of *Striga hermontheca*.
Emp. J. exp. Agric. 1955 : **23** : 206–13.

Evidence is presented showing that the susceptibility and resistance of *Sorghum* and *Pennisetum* species respectively on clay soils in the Sudan and the reverse reactions on sandy soils are due to the occurrence of two different strains of the parasite on the two soil types.

2343 ŽUMATOV, A. Ž.
(**Mičurinist millet growers of Kazahstan**).
Zemledelie (Agriculture) 1955 : No. 10 : 62–64. [Russian].

Beloe Uiljskoe [White Uil] has been selected from a *Panicum* population grown in the Aktjubinsk province. It is distinguished by uniform maturity, high yield, fair resistance to smut and good quality grain.

2344 KALTON, R. R., GRISSOM, D. B. & DYAS, E. S.
Grain sorghum a coming crop in Iowa?
Iowa Fm. Sci. 1956 : **10** : 167–70.

Trials have indicated that production of grain sorghum is likely to be most successful in the southern and western districts of Iowa. A number of F_1 hybrids have given considerably higher yields than the best varieties.

2345 BARABÁS, Z., IFJ.
Virágzásbiológiai problémák Sorghum-fajták nemesítésében. I. (**Problems of floral biology in breeding *Sorghum* varieties. I**).
Növénytermelés 1954 : **3** : 37–46.

In experiments carried out at Martonvásár, Hungary, the proportion of fertilization occurring in open-pollinated, emasculated flowers varied between 27·8% and 82·5%. Flower structure appears to favour cross pollination and it is thought that natural selfing does not take place. Controlled crosses are readily effected by tying the pollen parent and the emasculated female parent together. No close correlation was observed between early flowering and early ripening. In some varieties, including Rancher, formation of supernumerary stigmas and of twin seeds occurred. A sectorial chimera with partly red glumes has been found in Early Sumac. Types of sterility observed in sorghum varieties include pollen defects and abnormal lodicules resulting in the inability of the flowers to open and may be due to degeneration, physiological factors or disease; sterility may also be induced by treatment with growth substances.

2346 **Desirable qualities of sorgo, Johnson-grass combined in new hybrids.**
What's New Crops Soils 1955 : **8** : No. 2 : p. 24.

Work more fully described elsewhere (cf. Abst. 1028) is briefly reported.

2347 Krishnaswamy, N., Raman, V. S. & Chandrasekharan, P.
Studies on *Sorghum nitidum* Pers.
Curr. Sci. 1956 : **25** : 64–65.

A form with $2n = 10$ has been found, in addition to the 20-chromosome type. Both types have two nucleolar chromosomes in the somatic complement. At meiosis only bivalents were observed in both forms. The 20-chromosome type therefore does not appear to have arisen from a 10-chromosome form by duplication.

2348 Garber, E. D.
Cytogenetics of Sorghum. I. The orientation of interchange complexes and quadrivalents at metaphase I in *S. purpureo-sericeum*.
Bot. Gaz. 1955 : **116** : 369–72.

A full account of work summarized in Abst. 1316 is presented.

2349 Price, M. E. & Ross, W. M.
The occurrence of trisomics and other aneuploids in a cross of triploid x diploid *Sorghum vulgare*.
Agron. J. 1955 : **47** : 591–92.

A highly self-sterile triploid found in a population of White Collier and apparently of hybrid origin gave rise on pollination with diploid pollen to a population containing nine normal $2n$ plants, nine plants with $2n + 1$ chromosomes, three with $2n + 1 + 1$, one with $2n + 2$, one with $2n + 1 + 1 + 1$ and one with $2n + 2 + 1 + 1 + 1 + 1$. The aneuploids were all highly self sterile but generally set abundant seed when pollinated by diploid plants.

2350 Endrizzi, J. E. & Morgan, D. T. (Jun.)
Chromosomal interchanges and evidence for duplication in haploid *Sorghum vulgare*.
J. Hered. 1955 : **46** : 201–08.

In a maternal haploid plant originating from a cross between the *S. vulgare* 'Texas Blackhull' ♀ and *S. arundinaceum* ♂, one bivalent was found in each of four of the 26 pollen mother cells examined, the other chromosomes being univalents. Of the 29 F_1 individuals obtained by pollinating the haploid with Texas Blackhull, all but three underwent normal meiosis. One of the three cytologically abnormal plants was trisomic and the other two had translocations apparently due to crossing over between the duplicate sections of partially homologous chromosomes during megasporogenesis in the haploid.

The above evidence for duplications in the haploid is regarded as corroborating the theory of the allopolyploid origin of *S. vulgare*.

2351 **New hybrids to expand sorghum acreage; may displace other crops.**
What's New Crops Soils 1955 : **8** : No. 2 : p. 23.
Future of hybrid sorghums continually looks brighter.
Sth. Seedsman 1955 : **18** : No. 11 : 90, 103.

Sorghum hybrids developed through the use of male sterility are expected to be released to growers in spring 1956 by the US Department of Agriculture.

RICE

2352 Jodon, N. E.
Toro and Sunbonnet. Two new midseason, long-grain rice varieties compared.
Rice J. 1955 : **58** : No. 13 : 8–11.

Information is given on the performance of Toro (cf. *PBA*, XXV, Abst. 2014) and Sunbonnet (cf. *PBA*, XXIII, Abst. 2711), as observed in various tests in Louisiana, Texas and Arkansas. Toro produced the highest average yields, compared with Sunbonnet, Bluebonnet, Bluebonnet 50 and Improved Bluebonnet, except in Texas where it was outyielded by the last-mentioned variety.

Report of the sixth meeting of the working party on rice breeding held at Penang, Malaya, 5-11 December 1955.
FAO UN, Rome 1956 : Pp. 43. (Mimeographed).

Summaries are given of the reports submitted and discussions, of which the following are of particular interest to breeders:—

2353 *Reports from countries on progress in rice breeding in 1954.* (*pp.* 5–6).

Progress in several national breeding programmes is outlined.

2354 *The FAO international hybridization project.* (*pp. 6–9*).

Further *indica* x *japonica* crosses were effected at the Central Rice Research Institute, Cuttack, India, to provide seed for distribution to various countries.

Inheritance of sterility is quantitative. Sterility in some combinations depends not only on gametic sterility but also on failure of the embryos to develop after fertilization. In addition, experience in Malaya and Indonesia has indicated that the degree of sterility may be partially determined by the environment. In still other combinations, the cytoplasm may affect sterility.

A relationship detected between chromosome structure and photoperiodic response in *Oryza officinalis* suggests a possible method of evolution of *japonica* varieties from tropical *indica* types.

Classification of *Oryza* spp. is in progress at the above-mentioned institute.

Encouraging reports concerning the performance of *indica-japonica* derivatives were received from many countries.

The *japonica* parents Taichung 65 and Pebifun, from Taiwan, have given a consistently larger number of useful progenies in most countries, the ability of other *japonica* varieties to give satisfactory progenies varying from country to country. Crosses between *japonica* and some early-maturing day-neutral *indica* varieties show less sterility than crosses between *japonica* and late-maturing photosensitive *indica* types.

2355 *The maintenance of genetic stocks of rice.* (*pp. 10–12*).

Progress in the maintenance of stocks in cooperating countries is discussed.

2356 *The international training centre on rice breeding.* (*pp. 12–13*).

A brief account is given of the training course held during 1955 at the Central Rice Research Institute, Cuttack.

2357 *Resistance to lodging.* (*pp. 13–14*).

According to data obtained from work in different countries during the past three years no techniques of evaluating lodging resistance are likely to prove of general application. Lodging resistance is not necessarily closely related to short straw, thick straw and resistance to breakage, possibly because many characters are involved, which differ according to variety and environment.

2358 *Breeding for blast resistance.* (*pp. 17–18*).

Various measures to facilitate cooperative breeding for blast resistance are proposed.

2359 *The inheritance of yield components.* (*pp. 18–19*).

This discussion included a paper submitted by T. Matsuo who reviewed the experience gained in Japan with procedures involving quantitative characters contributing to yield. The approach adopted was to divide the rice-growing areas into ecological units and then ascertain the most important quantitative characters common for the varieties in each area. In classifying varieties, the panicle-number type and panicle-weight type may be distinguished. In general, varieties of the former type yield well in fertile areas whereas those of the latter are adapted to poor soils and lower temperatures. The main yield attributes studied have all proved to be polygenic, but, depending upon the correlations obtained in the different generations, some characters receive earlier attention in selection than others. Although the pedigree system is in general use in Japan, it is thought that the bulk method might be of value under certain conditions.

2360 *The linkage groups in rice.* (*pp. 19–20*).

More work on linkage is required in most Asiatic countries and a standardized and internationally accepted system of genic nomenclature should be adopted.

2361 *Cooperative variety trials.* (*pp. 20–22*).

Difficulties requiring solution before cooperative trials in different countries can be successfully initiated were discussed.

2362 *Interaction between varieties and fertilizers response.* (*pp. 22–23*).

Further evidence was obtained that marked differences in response to fertilizer exist within the *indica* group.

2363 *Preliminary report on laboratory milling and cooking tests with rice (Malaya).* (*p. 32*).

Cooking tests, in which the imbibition ratio was determined by a special technique devised in Malaya, showed that out of 15 *indica* x *japonica* samples, two had the quality of *japonica* rice, one intermediate quality and the remainder that of the *indica* type.

2364 *Nutrition studies of some promising lowland and upland varieties of the Philippines.* (*p. 32*).

The 13 varieties analysed showed only a narrow range in protein content (8·19–10·90% on a dry-matter basis). Breeding for high protein content is not therefore likely to be effective.

2365 *The problem of photoperiod in low altitudes. The photosensitivity of rice variety, Siam 29 (Malaya).* (*p. 33*).

Attention was drawn to the importance of small monthly variations in photoperiod in growing Malayan varieties. Investigations on five varieties (one day-neutral, two medium sensitive and two highly sensitive) indicated that the period of photosensitivity was limited to the period of growth after the age of 4 weeks and before flower formation, and that during this sensitive stage only a day length less than the critical one will affect the plant. The critical day length and length of the nonsensitive period may however differ according to variety. An experiment on the highly sensitive variety Siam 29 added corroborative evidence of the lack of sensitivity during the first 4 weeks of growth.

2366 *Further studies on the photoperiod response of Elon-Elon rice (the Philippines).* (*p. 33*).

Low temperature reduced the number of short days necessary for flower initiation but did not hasten flower development. Combination of low temperature and long-day treatment induced flowering. The photoperiodic stimulus was not transferable from one tiller to another.

2367 Japonica *type rice in the subcontinent of India and Java (Japan).* (*p. 34*).

Among crosses of *japonica* types with aus (autumn) and aman (winter) varieties from Pakistan, those involving aus rice showed the least sterility. Sterility was also relatively low in bulu (awned) x *japonica* crosses. It is suggested that aus rice of Pakistan may have given rise to *japonica* types. It may thus be postulated that *japonica* rice had two centres of origin, one in the north-east of the Indian subcontinent and the other in Java; but the absence of sterility in aman x aus combinations and the high degree of sterility in aman x *japonica* crosses require explanation.

2368 BONFIGLIOLI, O.
Possibili i 130 quintali per ettaro? (**Are 130 quintals per hectare possible**?)
Riso, Milano 1956 : **5** : 23–24.

It is reported that a yield of 115·09 c. per ha. was attained in 1955 from the rice variety Balilla a grana grossa [Large-grained Balilla] in a competition in which the object was to get a yield of 130 c. Some data are given concerning the characteristics of the variety (cf. *PBA*, XXV, Abst. 2032) and the yields obtained from it in different parts of Italy and the opinion is expressed that it will one day win the prize for 130 c. per ha.

2369 A3: un nuovo riso. (**A3: a new rice**).
Sementi elette 1955 : **1** : No. 1 : p. 68.

A3, a selection from Arborio, is described as a promising variety distinguished by high yield and freedom from lodging.

2370 PIACCO, R.
Varietà e sementi di riso. (**Rice varieties and seeds**).
Sementi elette 1955 : **1** : No. 2 : 18–22.

An outline is given of the improvement of rice varieties in Italy from the introduction from Japan of the variety Chinese (= Bertone) in 1821 and Chinese originario (= Americano 1600) in 1904, to the many selections made in the late nineteenth and early twentieth century by growers and scientific institutes, and to the later period of hybridization, with the result that over 40 good varieties are now available for all types of land and utilization.

The importance of selection for the maintenance of purity is also explained.

2371 BONFIGLIOLI, O.
Visita all'azienda S.A.P.R.I. (**A visit to the SAPRI farm**).
Sementi elette 1955 : **1** : No. 2 : 24–31.

A description is given of one of the most important Italian establishments for the production of pure seed of rice varieties, special mention being made of improvements effected in varieties such as Vialone, Stirpe 136 [Strain 136], Maratelli and Carnaroli as a result of selection aimed at maintaining varietal purity.

2372 DE BENI, U.
Nuove affermazioni del Balilla grana grossa. (**The merits of Balilla grana grossa affirmed again**).
Sementi elette 1956 : **2** : No. 3 : 49–51.

Yields of up to 115·092 c. per ha. have been obtained from this large-grained selection of Balilla (cf. *PBA*, XXV, Abst. 2032), which is described. Its resistance to *Fusarium* and high standing capacity have been confirmed and its grain commands a price somewhat above that of the common grades.

2373 VARENICA, E. T.
(**Rice cultivation in the Chinese People's Republic**).
Zemledelie (Agriculture) 1955 : No. 10 : 110–15. [Russian].

Mention is made of a number of Chinese varieties which have produced up to 49·9 c. per ha. in recent trials at Nanking; Sheng-li-shang [Victory], which is adapted to various climatic and soil conditions and does well in Kiangsu, Hupeh and other provinces, has out-yielded all other varieties. The runners-up included Chung-nung [? Chinese Agriculture] 4 and Chung-nung 34 which were obtained by single plant selection among material from Szechwan and Chekiang respectively. Both varieties are distinguished by productive panicles and resistance to lodging. Chung-nung 4 shows resistance to diseases.

Studies on rice breeding.
Ikushugaku Zasshi/Jap. J. Breeding 1954 : 4 : Annex : Pp. 323.

The following papers are of direct interest to plant breeders:—

2374 *Morinaga, T. Classification of rice varieties on the basis of affinity.* (*pp. 1–14*).

Attempts to classify rice varieties on the basis of the degree of sterility of their hybrids by N. Iso, S. Kato, J. W. Jones, H. Terao, U. Mizushima, T. Matsuo and H. Oka are reviewed. There is general agreement as to the distinction between the *japonica* and *indica* categories. It is also clear that an intermediate taxon occurs in Indonesia; the author suggests that this should be given the old epithet var. *javanica*.

2375 *Morinaga, T. & Kuriyama, H. Results of supplementary observations on the hybrid sterility in rice.* (*pp. 15–19*).

Tables are given of the percentage fertility of a series of crosses involving Japanese, Burmese, Chinese, Taiwan, Indian, Russian, Javanese, Italian and Indochinese varieties made in Japan in 1951–2.

2376 *Morinaga, T. Studies on the photoperiodism in rice.* (*pp. 21–34*).

A conspectus of the contents of 39 Japanese papers on photoperiodism in rice published during 1923–54 is presented.

2377 *Morinaga, T. & Kuriyama, H. Some experiments on the photoperiodism in rice.* (*pp. 35–63*).

Numerous experiments on the effect of various photoperiodic treatments on the developmental cycle of a series of varieties from Japan, Java, India and Pakistan were made. Many of the varieties from tropical latitudes would only come into ear under short photoperiods. The long vegetative period of the bearded Javanese rices is especially noted.

2378 *Morinaga, T. Intercross breeding of phylogenetically distinct groups of rice.* (*pp. 65–68*).

A brief account is given of Japanese experiments on crossing Japanese varieties with distantly related cultivated varieties from other countries, in particular the Chinese upland variety Sensho, the Chinese irrigated rice Toto, the Philippine variety Tadukan, the Indochinese variety Lua Rong and various types from Taiwan. All these crosses, except the last, were made with the primary objective of transferring resistance to *Piricularia* to Japanese varieties. The Taiwan varieties were used as sources of adaptation to tropical conditions.

2379 *Matsuo, T. Differentiation of ecotypes in the cultivated rice and the variation of characters resulting therefrom.* (*pp. 71–99*).

Ecotypic variation in rice varieties in respect of minimum germination-temperature, heading period, tendency towards premature heading, response to nitrogen and spacing arrangements, lodging, and resistance to borer and blast is discussed. The relationship between the ecotypes recognizable on the basis of these characteristics and the major taxonomic divisions of cultivated rice are considered.

2380 *Baba, I. & Harada, T. Physiological diseases of rice plant in Japan.* (*pp. 101–50*).

Reviews of data available on varietal resistance to autumn decline, potassium deficiency and straighthead caused by drought are included. The physiological basis of resistance to these conditions is also considered.

2381 *Kawada, A. Insect resistance of Japanese rice plant.* (*pp. 151–65*).

Japanese investigations on resistance of rice to *Chilo simplex*, *Chlorops oryzae*, *Sogata furcifera*, *Nilaparvata lugens*, *Agromyza oryzella* and *Aphelencoides oryzae* are reviewed. Data are included on varietal resistance, the physiological basis of resistance and the mode of inheritance of resistance.

2382 *Baba, I. Breeding of rice variety suitable for heavy manuring.* (*pp. 167–84*).

A review of the progress made in Japan in breeding rice for optimum response to nitrogenous fertilizers is presented. Heavy applications of fertilizers tend to result in infestation by blast unless the ratio of protein N/soluble N in the plant is high. Ability to absorb and deposit silica decreases liability to blast under conditions of heavy manuring.

2383 *Seko, H. Lodging in rice plant and its testing method.* (*pp. 185–98*).

The causes of lodging and suitable methods of estimating the degree of resistance to lodging are discussed.

2384 *Kondo, Y. Studies on cool tolerance of paddy rice varieties.* (*pp. 199–224*).

The following topics are reviewed: the physiological effects of unseasonable cold temperatures on rice; varietal differences in resistance to damage caused by low atmospheric temperatures or cool irrigation water; methods of estimating the degree of resistance to cold; and the Japanese breeding programme for producing cold-resistant varieties.

2385 *Kawahara, U. Program for propagation and distribution of superior rice seeds.* (*pp. 241–61*).

Regulations for the inspection of fields set aside for seed production of improved varieties of the major Japanese crops are described.

2386 *Sato, K. Relationship between rice crop and water.* (*pp. 263–308*).

This general survey of rice irrigation includes references to varietal differences in resistance to injury caused by submergence.

2387 *Komoda, Y. The theory and practice of two successive rice crops in temperate Japan.* (*pp. 309–17*).

Varieties sufficiently early to permit of two crops per year are mentioned. The maturation period of a variety depends on its total thermal requirement (2400° C. in Tomoemasari) but may be retarded if the variety is not adapted to the prevailing photoperiod. Earliness is inversely correlated with the number of leaves on the main stem.

2388 (**Synopsis of new varieties of crop plants for the summer of 1955**).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : p. 106. [Japanese].

Rice. Yaeho (Norin [Ministry of Agriculture and Forestry] 88), from Norin 23 x Norin 22, is a disease-resistant midlate variety suitable for Sanin and southern Hokuriku. Sachiwatari (Norin 89), from Tosan 38 x Kinki 35, is a mid-season rice suitable for southern Kanto, north-western Chugoku and the island of Shikoku. Megumiwase (Norin 90), from Norin 8 x Norin 17, is an early variety suitable for a number of areas in central Japan. Honenwase (Norin 91), from Norin 22 x Norin 1, is an early variety which germinates well at low temperatures; it is recommended for Hokuriku. Sekiminori (Norin 92), from Norin 13 x Norin 21, is a mid-season variety suitable for southern Tohoku and parts of Hokuriku. Kiyosumi (Norin 93), from Chibaasahi [Chiba Rising Sun] x Tosan 38, is a midseason rice recommended for southern Kanto and parts of Hokuriku.

2389 **Nato rice is released to certified growers for production of seed.**
What's New Crops Soils 1956 : **8** : No. 4 : p. 22.

Nato, an early variety developed at the Rice Experiment Station, Crowley, La., has shorter straw than Zenith, gives higher yields and is more easily threshed.

2390 **New medium-grain variety developed.**
Rice J. 1955 : **58** : No. 12 : p. 14.

The early medium-grain rice variety Nato (44C507) has been developed at the Louisiana State University Experiment Station, Crowley, from (Rexoro x Purpleleaf) x Magnolia (cf. Abst. 247). Compared with Zenith and Magnolia, it has higher yielding capacity, shorter straw, better threshability, and probably greater resistance to *Cercospora* leaf spot and white tip.

2391 Larter, L. N. H.
Rice variety trials in Malaya 1950-54.
Sci. Ser. Dep. Agric. Malaya 1955 : No. 26 : Pp. 60.

The results of 45 yield trials of wet padi varieties at 25 stations throughout the Federation are reported in detail and varieties recommended for further trial or pure line selection are noted (cf. *PBA*, XXIV, Abst. 356).

2392 Sampietro, G.
La nuova varietà di riso "Lomello." (**The new rice variety Lomello**).
Ann. Staz. sper. Risicolt. Colt. irrig. 1953 : **1** : 149–54.

The variety described originated from a cross of Agostano x R77 made in 1944; the F_1 was intermediate in most respects and segregation occurred in the F_2 without transgressing the parental limits. An F_3 selection with large grain finally gave rise to a line which is characterized by early maturity (vegetative period 154 days), freedom from lodging, long slender grain and good yield and has been named Lomello.

2393 Jodon, N. E.
Present status of rice genetics.
Chunghua Nunghsueh Hui Pao/J. agric. Ass. China 1955 : No. 10 : 5–21.

This is the full version of the paper summarized in *PBA*, XXIV, Abst. 943.

2394 Marie, R.
Contribution a l'étude du riz en France. (**Contribution to the study of rice in France**).
Ann. Inst. nat. Rech. agron., Paris 1955 : Sér. B. : **5** : 463–535.

A comprehensive account of current work at the Le Merle experimental rice plantation (cf. Abst. 446) is given and the principal varieties under trial at the station or already approved for general cultivation in France are described.

Maratelli gave the highest yields. Hybrids from crosses between varieties with long grains and those with short grains contained a large percentage of sterile flowers with desiccated glumes. Brittleness of the mature grain was shown to be a hereditary character influenced to some extent by the environment. Crosses between resistant and susceptible varieties showed that resistance to shedding was dominant in the F_1. Crosses between plants with red grains and those with white grains indicated that red pericarp was dominant over white and presumably arises in cultivated stocks as the result of the mutation of a single gene. Plants with red grains showed an increased tendency to shedding, a fact that may explain the rapid spread of red-grained forms in rice fields not subjected to crop rotation. The F_2–F_4 of crosses between red-grained and white-grained parents contained a high percentage of pink-grained plants; it is suggested that a modifier may be involved.

2395 YAMAKAWA, U. *ET AL.*
(On the new rice variety Benisengoku).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1954 : **2** : 205–28. [Japanese].

Benisengoku (= Norin [Ministry of Agriculture and Forestry] 82) was selected from the cross Tokaiasahi [Tokai Rising Sun] x Kinki 39. It is a high-yielding disease-resistant variety recommended for northern Kyushu.

2396 NAGAMATSU, T. & IKEDA, H.
(A small experiment concerning degeneration of rice varieties).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 127–30. [Japanese].

Progenies obtained by (1) selfing and (2) intravarietal crossing of the varieties Bantoshinriki [Late Divine Power rice], Asahi [Rising Sun] and Norin [Ministry of Agriculture and Forestry] 18, released 80, 50 and 10 years ago, respectively, were compared. Evidence of heterosis in respect of such characters as tiller number, culm length and ear number was obtained in the case of the intravarietal crosses of the older varieties, especially Bantoshinriki.

2397 SAKAI, K.
Secondary selection and a plan for multiplication of superior seed of rice varieties.
Indian J. Genet. 1955 : **15** : 18–24.

In discussing the possible effectiveness of secondary selection, it is concluded that such selection is likely to bring about improvement in varieties selected from hybrid populations. A plan for seed multiplication including both yield and heritability tests of rogued lines of the foundation stock during the third year of the scheme is therefore suggested. Most of the mixed seed from the best lines is delivered to the extension seed farm; the remainder is planted in the breeder's stock field as the starting point of another cycle of seed multiplication.

2398 CHANG, W.-T.
(Reciprocal translocations in rice induced by X rays).
Chunghua Nunghsueh Hui Pao/J. agric. Ass. China 1955 : No. 9 : 50–59. [Chinese].

A Japanese version of this article was summarized in Abst. 1327.

2399 CHANG, W.-T. & HSIEH, S.-C.
(Studies on the development of the embryo sac and pollen grains in tetraploid rice).
Nungyeh Yenchiu/Agric. Res., Taipei 1954 : **5** : Nos. 1–2 : 17–30. [Chinese].

In continuation of the studies summarized in *PBA*, XXIV, Abst. 2997, the authors examined the ontogeny of the embryo sac and pollen grains to see to what extent abnormal development of these organs accounted for the high degree of sterility of the tetraploid lines. A considerable number of developmental aberrations were observed, especially in the embryo sacs, but the frequency of these aberrations was considerably less than the incidence of sterile seed.

2400 TAKAHASHI, M.
(Studies on rice hybridization. XVII. Seed formation in tetraploid rice).
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 62–70. [Japanese].

A description is given of various developmental abnormalities affecting the embryo and endosperm of tetraploid rice lines and contributing to their sterility.

2401 HSIEH, S. C. & CHANG, W. T.
Studies on behavior of chromosomes and development of embryosacs and pollen grains in haploid rice plant.
Nungyeh Yenchiu/Agric. Res., Taipei 1954 : **4** : No. 4 : 1–9.

Meiosis in two haploid strains is described. In both, 1–2 univalents were formed at metaphase I. Sterility was complete.

2402 OKA, H.
Studies on tetraploid rice. VI. Fertility variation and segregation ratios for several characters in tetraploid hybrids of rice, *Oryza sativa*, L.
Cytologia, Tokyo 1955 : **20** : 258–66.

F_1 hybrids between colchicine-induced tetraploids of Continental and Insular varieties were more fertile than their 4*n* parents, but the mean fertility declined in subsequent generations, although individuals with a high degree of fertility occurred in each generation. Fertility was positively correlated with height in each generation. F_2 ratios for segregation with respect to seed reaction to phenol (*Phph*), non-glutinous *vs.* glutinous endosperm (*Glgl*), apiculus pigmentation (*Cc*) and seed-coat colour (*Rcrc*) were in agreement with the assumption of random pairing of the chromosomes. In one cross certation in favour of *Gl* pollen occurred. The rise in fertility following upon hybridization of 4*n* forms of distantly related varieties is ascribed to the action of complementary genes from both parents.

It is suggested that variation in cultivated rice is mainly due to genic changes rather than to structural alterations of the chromosomes.

2403 OKA, H. & TSAI, K.-H.
(Varietal differences in the dormancy and longevity of rice seedlings. Phylogenetic differentiation of cultivated rice. X).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 90–94. [Japanese].

In the present number of this series (cf. *PBA*, XXIV, Abst. 3000), the author investigated the dormancy and longevity of the grains of a series of Far Eastern varieties under various temperature conditions. Continental varieties tended to germinate best at relatively high temperatures, Insular varieties at rather lower temperatures. Marked varietal differences in length of dormancy were noted, Insular varieties tending to have longer dormancy periods. Longevity tended to be greater in Continental varieties than in Insular.

2404 **(On the genetics of heading period in rice).**
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : p. 94. [Japanese].

A short synopsis of papers on the genetics of the above character is given.

2405 MISRA, G.
Effects of long photoperiod on four varieties of late-winter rice.
Sci. & Cult. 1956 : **21** : 383–84.

Plants of four varieties grown in Orissa, viz. C3, SR26B, FR13A and FR43B, were exposed to a photoperiod of 24 hours for 3 or 6 weeks from the age of 1 week. Long photoperiod had no effect upon the time taken until ear emergence. In all varieties treatment for 3 weeks caused a significant increase in grain yield, mainly as the result of increases in the grain number, spikelet number and percentage of grain set per panicle.

2406 ROY, S. K. & SUBRAMANYAM, K. N.
Photoperiodic response of some early varieties of rice of Bihar.
J. Indian bot. Soc. 1955 : **34** : 455–58.

In investigations at the Rice Research Station, Sabour, early-maturing autumn varieties could be classified into short-day, long-day and neutral types according to their response to an 8-hour photoperiod.

2407 MISRA, G.
Effects of long photoperiod on four early-winter varieties of rice.
Curr. Sci. 1955 : **24** : 421–22.

When week-old seedlings of the varieties T17, T23, T36, and T1145 were exposed to continuous illumination for three weeks, at Ravenshaw College, Cuttack, all showed a significant increase in grain yield over the controls. Six weeks' continuous illumination of the seedlings gave no increase in grain yield but resulted in a significant delay in ear emergence in T23.

2408 NAGAMATSU, T. & ISHIKAWA, F.
(Studies on the geographic distribution of cultivated rice. VII. On variation in grain shedding and its geographical distribution).
Kyushu Daigaku Nogakubu Gakugei Zasshi/Sci. Bull. Fac. Agric. Kyushu Univ. 1954 : **14** : 313–18. [Japanese].

In continuation of the researches summarized in *PBA*, XXIV, Abst. 1137, the authors examined the natural and artificially-induced tendency towards shedding of the Kyushu rice varietal collection. Natural and artificial shedding were highly correlated though cases did occur in which a variety resistant to natural shedding was susceptible to artificially-induced shedding. Resistance to shedding was mainly found in rices from high latitudes, i.e. from Japan, Manchuria, Korea and Italy.

2409 CHO, J.
Cytological study of double fertilization in *Oryza sativa* L.
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 131–48.

A detailed description is given of the course of double fertilization in the varieties Rikuu 132 and Senichi. Nuclear fusion occurs 1½–4 hr. after anthesis. Nucleolar fusion occurs after 4–7 hr. A small quantity of male cytoplasm appears to accompany the male gametes and unite with the egg and polar cytoplasms.

2410 SMITH, G. T.
Cooking qualities of rice being tested.
Rice J. 1956 : **59** : No. 1 : 24–25.

A popular account is given of tests employed at the regional laboratory recently established at Beaumont, Tex., to determine the quality of rice strains.

2411 OKA, H.-I.
Change of gene frequency and a restriction on gene recombination in hybrid populations of rice due to gamete-development genes and duplicate fertility genes.
Chunghua Nunghsuek Hui Pao/J. agric. Ass. China 1955 : No. 10 : 22–29.

F_2 sterility resulting from the double recessive condition of duplicate fertility genes is reported in the cross 70^a som cau x Kaniranga. Sterility due to gamete development genes disappears rapidly on inbreeding; sterility due to duplicate fertility genes persists longer. It was shown in the cross PTB10 x Kinoshitamochi [Kinoshita Glutinous] that the above types of sterility genes tend to restrict gene recombination.

2412 OUANG [WANG], T.-Y.
(**Disquisition on the nomenclature and classification of *Hsien* and *Keng* rices**).
Chunghua Hunghsueh Hui Pao/J. agric. Ass. China 1955 : No. 9 : 73–79. [Chinese].

The Chinese word *Hsien* is taken as corresponding to *Oryza sativa* var. *indica* and *Keng* to var. *japonica*. Since *Keng* rice has apparently been known in China for some five thousand years and is believed to have orginated there, it is proposed that var. *japonica* be known in future as subsp. *keng* or *chinensis*. Var. *indica* may be designated as subsp. *sen* or *indica*.

2413 PIACCO, R.
Prove di acclimatazione di varietà di riso degli U.S.A. (**Tests of acclimatization of rice varieties from the USA**).
Ann. Staz. sper. Risicolt. Colt. irrig. 1953 : **1** : 79–100.

The reasons why varieties recently introduced into Italy from the USA and elsewhere have not been successful are analysed and information is presented in respect of the rice varieties grown at present in the USA. Descriptions are given of 20 American varieties and of their behaviour in tests in Italy. The varieties with long slender grains are considered to be of interest for Italy but only Century Patna and Patna matured and these are not of good enough quality to merit introduction. In the medium group Magnolia, Early Prolific and Edith Long matured and might be of interest for southern Italy or the islands. In the short group only Cody ripened.

Of all the varieties Magnolia seems the most promising on account of its long grain, high yield and freedom from lodging.

2414 (**Cytogenetical studies on the yield components of rice**).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 86, 89, 126. [Japanese].

A brief synopsis is presented of papers dealing with the genetics of density of grains along the panicle, panicle length, the "combined spikelet" character (cf. *PBA*, XV, Abst. 33), yield, stem height, habit of the stem and leaves, grain characteristics and tillering.

2415 NAGAO, S. & MOU, T.-S. (Recorder)
(**Injury caused by cold to rice in the northern parts of Japan and inspection of the rice crop as a means of protection against cold**).
Chunghua Nunghsueh Hui Pao/J. agric. Ass. China 1955 : No. 9 : 80–83. [Chinese].

The incidence of low-temperature damage of rice in northern Japan is discussed, special attention being paid to tapetal hypertrophy and varietal differences in susceptibility to cold (cf. *PBA*, XXIII, Abst. 2723).

2416 LI, H.-C.
(**The connexion between seedling resistance of rice to blast and resistance of the leaves in the field**).
Nungyeh Yenchiu/Agric. Res., Taipei 1954 : **4** : No. 4 : 33–37. [Chinese].

A series 52 Peng-lai varieties of the *japonica* type and 38 I-chi-tsai-lai native *indica* rices was subjected to artificial inoculation with *Piricularia oryzae* under conditions of heavy nitrogenous fertilization. The tests were made at the seedling stage and later in the field just before heading. The degree of resistance of the varieties at each stage in the life cycle is given. In general, the degrees of resistance at the two stages were significantly correlated.

2417 Narasingarao, M. B. V.
A note on short duration blast resistant paddy cultures for Andhra state.
Andhra agric. J. 1955 : **2** : p. 261.

Cultures 6522 and 6517, developed at Coimbatore from crosses of a short-duration Co. strain with the blast-resistant variety Co. 4, have displayed a high degree of resistance to this disease in Andhra.

2418 Nishizawa, T. & Yamamoto, S.
(**Studies on the resistance of rice varieties to nematode infestation. III. Tests of the damage caused by this pest**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1951 : **1** : 65–66. [Japanese].

Data are provided on the degree of injury caused to a set of Japanese irrigated varieties.

2419 Nishizawa, T., Yamamoto, S. & Mizuta, H.
(**Studies on the resistance of rice varieties to nematode infestation. IV. Trials of rice varieties**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1951 : **1** : p. 67. [Japanese].

In continuation of the work summarized in Abst. 2418, data are provided on the varietal resistance of eight upland varieties.

2420 Nishizawa, T., Yamamoto, S. & Mizuta, H.
(**Studies on varietal resistance to infestation by rice nematode. VII**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1953 : **2** : 71–80. [Japanese].

Observations on the symptoms produced by inoculating susceptible and tolerant varieties with infected grains are reported (cf. Absts. 2418 and 2419).

OTHER CEREALS

2421 Portères, R.
Les céréales mineures du genre *Digitaria* en Afrique et en Europe. (**The minor cereals of the genus *Digitaria* in Africa and Europe**).
J. Agric. trop. Bot. appl. 1955 : **2** : 349–86.

Edible species of *Digitaria* grown in Europe and Africa are listed and botanical descriptions given of *D. exilis*, *D. iburua*, *D. sanguinalis*, *D. adscendens*, *D. debilis*, *D. velutina* and less important species. A note is included on the vernacular names of some of the species grown in French and British territories in West Africa.

FORAGE GRASSES

2422 Jones, K.
The role of population cytology in evolutionary studies.
Heredity 1955 : **9** : p. 418. (Abst.).

Preliminary studies have been made at the Welsh Plant Breeding Station, Aberystwyth, of cytological variation in populations of *Holcus mollis* ($2n = 28$), *Dactylis glomerata* ($2n = 28$) and *Anthoxanthum odoratum* ($2n = 20$). In *H. mollis*, experimentally grown seedlings differ considerably in chromosome number from plants from natural populations and give better seed set and germination. It is stated that "studies in *Dactylis* and *Anthoxanthum* show differing degrees of hybridity selection in the two species whilst their high degree of quadrivalent formation despite the action of natural selection leads to the conclusion that they, along with other species of a similar type, do not evolve towards complete bivalent formation."

2423 Tateoka, T.
Karyotaxonomy in Poaceae. II. Somatic chromosomes of some species.
Cytologia, Tokyo 1954 : **19** : 317–28

Chromosome numbers ($2n$) in 53 species are reported, the following for the first time: *Sasamorpha purpurascens*, 48; *Calamagrostis arundinacea* var. *brachytricha*, 42, 56; *Calamagrostis hakonensis*, 28, 56; *Calamagrostis langsdorffii*, *Alopecurus japonicus*, *Poa acroleuca*, *Cinna latifolia* and *Festuca ovina* var. *supina*, 28; *Helictotrichon hideoi*, 14; *Anthoxanthum japonicum*, 70; *Hierochloe odorata* var. *pubescens* and *Festuca rubra* var. *pacifica*, 42; *Melica onoei*, 18; *Torreyochloa viridis*, 21; *Glyceria ischyoneura*, 40; *G. lithuanica* and *G. alnasteretum*, 20; *Moliniopsis japonica*, 50; *Phragmites japonica*, 48; *Eragrostis ferruginea* and *Themeda japonica*, 80; *Isachne globosa*, 60; and *Imperata cylindrica* var. *koenigii* and *Microstegium japonicum*, 20. Caryotypic differences between the closely related species *Poa annua* ($2n = 28$) and *P. acroleuca* are noted. Two of the 16 chromosomes observed in the $2n$ complement of *Koeleria cristata* were very small, probably being supernumeraries. The genera *Milium*, *Torreyochloa* and *Glyceria* are discussed from the caryotaxonomic aspect.

2424 KNEEBONE, W. R.
Breeding for seedling vigor in sand bluestem (*Andropogon hallii* Hack.) and other native grasses.
Agron. J. 1956 : **48** : 37–40.

Ranges in average weight per 500 seeds within sand bluestem (*Andropogon hallii*), Indian grass (*Sorghastrum nutans*), switch-grass (*Panicum virgatum*), buffalo grass (*Buchloe dactyloides*) and side-oats grama (*Bouteloua curtipendula*) were determined. Of the species studied, sand bluestem appeared to be the most promising with respect to breeding for increased seed size and seedling vigour. Large-seeded selections tended to set seed better and have less damaged seed in processing and more vigorous progenies than small-seeded selections.

One cycle of selection of side-oats grama for seedling vigour had a marked positive effect upon this character. The plants derived from seed of the selections also showed an increase in caryopsis size.

2425 ČUMAKOV, V.
Doopel'ovanie - účinné opatrenie v semenárstve tráv. (**Supplementary pollination, an effective measure in the seed production of grasses**).
Pol'nohospodárstvo 1955 : **2** : 366–72.

Supplementary pollination in grass-seed production has proved of value in Czechoslovakia. Repeated supplementary pollination increases the effect. The technique involves drawing a string through the mother plants at flowering time, just under inflorescence level.

2426 NEAL-SMITH, C. A.
Report on herbage plant exploration in the Mediterranean region.
Rep. FAO UN, Rome 1954 : No. 415 : Pp. 39. (Mimeographed).

During the above exploration, conducted in 1954 by the Food and Agriculture Organization of the United Nations in conjunction with the Commonwealth Scientific and Industrial Research Organization of Australia, 73 species of grasses and legumes were collected from a wide variety of environments. Much of the material is drought resistant and may be of genetical value.

2427 SKALIŃSKA, M.
***Poa nobilis* n. sp., a new viviparous species of the High Tatra.**
Acta Soc. Bot. Polon. 1955 : **24** : 749–61.

P. nobilis, a new viviparous species comprising several biotypes found in the Tatra mountains, is described. Its morphology and the high aneuploid chromosome numbers of its biotypes ($2n = 61$–82) suggest that it should be assigned to the section *Stoloniferae*. It is thought to be of hybrid origin, the putative parent species being *P. granitica* and *P. alpina* var. *vivipara*.

2428 MANNER, R.
Hammenhögs Eko rödven. (**The Hammenhög bent Eko**).
Våren 1956. Hammenhögs, Otto J. Olson & Sons AB : 12–14.

Eko, a new variety selected from imported New Zealand material, is described. It gives high seed yields and has proved suitable for lawns and sports grounds.

2429 CAMUS, A.
Un *Phleum* nouveau du Liban. (**A new *Phleum* of the Lebanon**).
J. Agric. trop. Bot. appl. 1955 : **11** : 203–04.

Ph. mouterdei, a new species discovered in the Lebanon, is described. It differs from *Ph. alpinum* in having a longer ligula and a green and more compact inflorescence.

2430 MANNER, R.
Hammenhögs Favörtimotej. (**The Hammenhög timothy Favör**).
Våren 1956. Hammenhögs, Otto J. Olson & Sons AB : 3–5.

The new variety Favör [Favour], formerly known as Hammenhög 9499, is a selection from Hammenhög 5023, itself selected from wild material in 1936. In recent trials it has outyielded Vanadis, Omnia and Kämpe [Champion] II by a considerable margin and is also more resistant to drought than any of these three varieties, which are at present the most widely cultivated strains in Sweden. Favör possesses a good tillering capacity and recovers quickly after cutting.

2431 MILLER, H. W.
Blando brome grass.
Seed World 1955 : **77** : No. 11 : p. 8.

New annual strain of soft chess, Blando bromegrass, is offered for use on dry-land range in California.
What's New Crops Soils 1955 : **8** : No. 2 : p. 26.

Developed in California, the winter-growing variety Blando (*Bromus mollis*) is recommended primarily for converting land under grain crops into grassland, when use of perennial species would be unsuitable, and for reseeding after brush burning.

2432 JULÉN, G.
Svalöfs Frigga foderlosta. (**Svalöf's Frigga brome grass**).
Allmänna Svenska Utsädesaktiebolaget, Svalöf 1956 : 27–28.

Frigga, a variety of *Bromus inermis* developed by the Swedish Seed Association, Svalöf, from local material from Östergötland, is early, tall and stiff strawed. Its growth is vigorous and it is equal to Prior in yield but superior in seed quality.

2433 NIELSEN, E. L.
Cytological disturbances influencing fertility in *Bromus inermis*.
Bot. Gaz. 1955 : **116** : 293–305.

This is a full report of work summarized in *PBA*, XXV, Abst. 1741.

2434 MANNER, R.
Hammenhögs Italenska rajgräs "Novita." (**The Hammenhög Italian ryegrass Novita**).
Våren 1956. Hammenhögs, Otto J. Olson & Sons AB : 6–7.

Novita, formerly Hg012, is a selection from Tystofte. In trials at Gullåker, Sweden, in 1952–55 it outyielded Imperial and Tystofte by 6·6 and 4·1% respectively and was also slightly more resistant to low temperatures than either of these two standard varieties. In recovery capacity it was equal to Tystofte and superior to Imperial.

2435 SVĚTLÍK, V. & DIVIŠ, J.
Pícninářské využití jednotlivých druhů jílků. (**The utilization of different species of ryegrass for forage**).
Za socialist. Zeměd. 1956 : **6** : 341–45.

Mention is made of a productive perennial hybrid between English and Italian ryegrasses which has been bred at Novy Jičín in Czechoslovakia. It is distinguished from the former by production of many leafy stems after the first cut and from the latter by greater vitality and improved resistance to frost and diseases.

2436 COOPER, J. P.
Selection and population structure in *Lolium*.
Heredity 1955 : **9** : p. 418. (Abst.)

The locally adapted ryegrass population Irish Commercial, which gives a high seed yield in the first harvest year, shows considerable uniformity in flowering behaviour but is genetically heterogeneous. Similar phenotypic uniformity and genotypic variation have also been found in annual Wimmera ryegrass and in Kent Indigenous perennial ryegrass. All three populations are the result of many generations of phenotypic selection.

2437 DE HAAN, H.
Origin of Westerwolths ryegrass (*Lolium multiflorum westerwoldicum*).
Euphytica, Wageningen 1955 : **4** : 206–10.

It is suggested that Westerwolths ryegrass, an annual variety, may have arisen through the selection and stabilization of annual types resulting from the farming practice, in Westerwolde, Netherlands, of resowing grassland yearly with seed gathered the previous year.

2438 WIT, F. & SPECKMANN, G. J.
Tetraploid Westerwolths ryegrass.
Euphytica, Wageningen 1955 : **4** : 245–53.

In progeny tests of the best tetraploid plants raised at Wageningen from colchicine-treated seed of Westerwolths ryegrass the C_2 families equalled the original diploid variety in yield of dry matter and were more drought resistant but came into ear later.

2439 HRISTOV, M. A.
(An experiment on extension and stabilization of branching of a form of *Lolium perenne* with a branched ear).
Naučn. Trud. Selskostopan. Akad. Georgi Dimitrov Agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1952 : **1** : 133–36. [Bulgarian].

A plant with branched ears found in Sofia was divided into several parts, some of which were grown on rich soil, and others on poor soil. Of the 148 plants, 48 bore normal ears and the rest branched and normal ears. The percentage of branched ears was higher among plants grown on rich than on poor soil.

2440 **Making new grasses.**
Agric. Res., Wash. 1956 : **4** : No. 7 : 12–13.

Breeding is being carried out at the US Northeastern Regional Pasture Research Laboratory, State College, Pa., to develop grasses with the merits but not the disadvantages of the fescues. Triploids obtained from *Lolium perenne* ♀ x 4*n* *Festuca elatior* ♂ are highly sterile but more vigorous than either parent and more rust-resistant than *F. elatior*. Of possible commercial value, they are being X-irradiated in the hope of altering the chromosome pairing so that fertility is obtained. Hybrids of the triploids with 4*n* *F. elatior*, 2*n* *L. perenne* and *F. arundinacea* (2*n* = 42) are now being studied.

2441 KNIGHT, W. E.
The influence of photoperiod and temperature on growth, flowering, and seed production of Dallisgrass, *Paspalum dilatatum* Poir.
Agron. J. 1955 : **47** : 555–59.

Two strains tested for reaction to various photoperiodic treatments under greenhouse conditions flowered soonest and gave the highest seed yield under a 14-hour photoperiod with high night temperatures (65–70° F.), retardation or inhibition of flowering occurring under longer or shorter photoperiods or lower temperatures.

2442 Kanariezaad, 1956. (**Canary grass, 1956**).
Landbouwvoorlichting 13 : Bijl. 4; Ber. Rassenkeuze 1956 : No. 201 : unpaginated.

Brief data on the three principal varieties grown in the Netherlands are presented.

2443 VARGAS S., R., SWANSON, A. F. & ROJAS M., E.
Comparativo de variedades de sorgo. (**Comparison of sorghum varieties**).
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 340 : 1–8. (Mimeographed).

Tests carried out in Peru with a number of sorghum varieties from the USA showed Sugar Drip to be the best among the forage varieties, though its yield of forage in the first of the two cuts was less than that of the maize variety Amarillo Diminich [Diminich Yellow] grown as control. Among the broom sorghums the variety White Station gave the best yield of fibre, followed by Rennel and Tennessee.

2444 CAMUS, P. A.
Andropogonées nouvelles du Cambodge et du Viet-Nam. (**New Andropogoneae of Cambodia and Viêtnam**).
J. Agric. trop. Bot. appl. 1955 : **11** : 201–03.

Botanical descriptions of three new species and one new variety recently discovered in Indochina are given. *Chrysopogon leucotrichus* was found in the vicinity of Battambang, Cambodia. It differs from other species of the same genus in that the bristles of the spikelets are white and the spikelets themselves extremely small. *Hyparrhenia schmidiana* was discovered at Juga, Viêtnam, at a height of 900 m. Its morphological characters are compared with those of *H. effusa*. *Iseilema schmidii* was found on the plains of Sisophon, Cambodia. The author compares it with *I. wightii*, *I. thorelii* and *I. munitiflorum*. *Eragrostis montana* var. *schmidiana* is a new botanical variety found in the Siem-réap province of Cambodia.

2445 CELARIER, R. P. & HARLAN, J. R.
Studies on old world bluestems.
Tech. Bull. Okla. agric. Exp. Sta. 1955: No. T–58 : Pp. 31.

The following species complexes are discussed, mainly with reference to their morphological features: *Bothriochloa decipiens*, *B. intermedia*, *B. pertusa*, *B. ischaemum*, *B. venusta*, *Dichanthium sericeum*, *D. annulatum* and *D. caricosum*. Comments on agronomic performance are included. All specimens of *D. sericeum* and some of *D. annulatum* proved to be diploid ($2n = 20$). Representatives of the other complexes were tetraploids or hexaploids.

2446 CARR, D. J. & ENG KOK NG
Experimental induction of flower formation in kikuyu grass (*Pennisetum clandestinum* Hochst. ex Chiov.)
Aust. J. agric. Res. 1956 : **7** : 1–6.

In experimental strains grown at the University of Melbourne, flower initiation could be induced only after severe defoliation and decapitation of the shoots. Some of the most vigorous strains appear to be male sterile and the importance of using such lines as well as hermaphrodite material in any breeding programme is stressed. It is suggested that Narayan's maternal hybrids from a cross between the male-sterile seed parent Rongai and the hermaphrodite pollen parent Kabete (cf. *PBA*, XXV, Abst. 3118) are the result, not of pseudogamy, but of heterozygosity for dominant or recessive male sterility in one of the parents.

2447 CAMUS, A.
Quelques Graminées de Madagascar et de l'Ile Maurice. (**Some Gramineae of Madagascar and Mauritius**).
Bull. Soc. bot. Fr. 1955 : **102** : 347–49.

Brief botanical descriptions are given of *Eragrostis propinqua* and *E. boivini* and of the two new species *E. viguieri* and *E. majungensis*, both of which were discovered by the author in Madagascar.

2448 ASHMAN, R. B.
A cytological study of the induced octoploid of an Agropyron-Hordeum hybrid.
Abstr. Thes. Utah St. Agric. Coll. 1955 : **3** : No. 3 : 75–76.

By artificial synthesis the parents of a sterile natural hybrid were identified as *A. trachycaulum* and *H. jubatum*. Cytological data on the octoploid obtained by colchicine treatment of the hybrid indicated that it had the genome AAAABBCC. The octoploid had 44% pollen sterility, mainly as the result of the production of micronuclei consequent upon the formation of laggards. In spite of its reduced fertility, the octoploid may be of economic importance on account of its perennial habit and vigour.

2449 Ashman, R. B. & Boyle, W. S.
A cytological study of the induced octoploid of an *Agropyron-Hordeum* hybrid.
J. Hered. 1955 : **46** : 297–301.

An octoploid with 44% pollen abortion and about 30% seed set was induced by colchicine treatment of a sterile tetraploid hybrid between *A. trachycaulum* and *H. jubatum.* Twenty different types of chromosome associations were observed in meiotic cells, but 58% of the cells showed one of the following three configurations: 28_{II}; $1_{IV} + 26_{II}$; $1_{IV} + 25_{II} + 2_{I}$. Bivalents were present in all cells with an average of 25·6 per cent. per cell. The genomic formula AAAABBCC is suggested. The incomplete fertility appears to be caused largely by lagging chromosomes and the resulting formation of micronuclei. The viable caryopses produced germinated readily and produced vigorous plants.

2450 Hunziker, J. H. & Covas, G.
Estudios morfológicos y citogenéticos sobre el híbrido artificial *Agropyron scabrifolium* x *Hordeum hexaploidum.* (**Morphological and cytogenetic studies of the artificial hybrid *A. scabrifolium* x *H. hexaploidum*).**
Rev. Invest. agríc. B. Aires 1955 : **9** : 155–75.

In most morphological features the hybrid described was intermediate between the parental species, except in the ear, where there were 3 spikelets per node at the base, 2 higher up and 1 in the upper half; the number of glumes per floret varied from 6 towards the base to 2 towards the apex. Similar features were found in a wild grass found at Calmuco and previously classified provisionally as *A.* sp. 'Calmuco'. Meiosis was almost normal in *A. scabrifolium* and somewhat less so in *H. hexaploidum*; both species formed fertile pollen. The hybrid displayed the usual meiotic irregularities, including many univalents and low chiasma frequency; it was completely sterile. *A.* sp. 'Calmuco' proved to be hexaploid and quite fertile and it is suggested that it may be an allopolyploid hybrid from some tetraploid species of *Agropyron* and a diploid species of *Hordeum.*

2451 Matsumura, S. & Sakamoto, S.
Karyotypes of diploid *Agropyron* species.
Wheat Inform. Serv. Kyoto 1955 : No. 2 : p. 19.

The centromeres of most of the chromosomes of *A. elongatum* are median and submedian but those of all the chromosomes of *A. triticeum* are subterminal. This observation supports the senior author's view that *A. elongatum* carries genome B.

2452 Sarkar, P.
A karyomorphological study on the genus *Eremopyrum.*
Wheat Inform. Serv. Kyoto 1955 : No. 2 : 17–19.

The taxonomy of the wheat grasses is discussed, with particular reference to the classification proposed by Nevskiĭ, assigning *Agropyron* spp. to three genera, viz. *Roegneria, Elytrigia* and *Eremopyron.* Caryotype analysis of some of the species placed by Nevskiĭ in the last-mentioned genus showed that (1) *E. triticeum* differs from other wheat grasses in having subterminal centromeres, instead of median or submedian centromeres, (2) *E. hirsutum* is similar to *E. triticeum*, except that it possesses two pairs of chromosomes with longer distal arms and (3) 14 of the chromosomes of *E. orientale* $2n = 28$ are similar to those of *E. triticeum*, the remaining 14 having median or submedian centromeres. Possibly *E. orientale* is an amphidiploid.

LEGUMINOUS FORAGE PLANTS

2453 Battle, W. R. & Panella, A.
Il miglioramento genetico delle colture foraggere. (**The genetic improvement of forage crops**).
Ital. agric. 1955 : **92** : 862–70.

In a review of breeding work with forage plants in the USA reference is made to the production of Atlantic, Buffalo and Ranger lucernes, followed by Narragansett, Vernal and others. The methods of testing new varieties and of producing foundation seed are described and an outline is given of the breeding methods employed; these include the study of local populations from different parts of the world for use as initial material, mass selection, maternal-line selection, clonal testing, production and testing of polycross seed, and the formation of synthetic varieties comprising 2–3 and up to 7–8 initial lines. Finally the possibility of producing hybrid varieties displaying heterosis is discussed.

2454 BROWN, E. B. & GOODEY, J. B.
Observations on a race of stem eelworm attacking lucerne.
Plant Path. 1956 : **5** : 28–29.

The lucerne varieties Nemastan and Synthetic "A" and other legumes were resistant and Grimm and Du Puits lucernes and Alsike clover susceptible to *Ditylenchus dipsaci* in a test conducted in Great Britain.

2455 WILSIE, C. P. & GROSS, H. D.
Vernal increases alfalfa possibilities.
Iowa Fm. Sci. 1956 : **10** : 173–74.

The synthetic lucerne variety Vernal, developed at the Wisconsin Agricultural Experiment Station, has shown high yielding capacity and persistence in Iowa (cf. *PBA*, XXIII, Abst. 2008). It withstands frequent cutting or grazing and lends itself to flexibility in management. Its pedigree involves Cossack selections, *Medicago falcata*, Ladak and Kansas Common.

2456 DAVIS, R. L.
An evaluation of S_1 and polycross progeny testing in alfalfa.
Agron. J. 1955 : **47** : 572–76.

Correlation coefficients between parents and their S_1 and polycross progenies were calculated for vigour, yield, incidence of *Pseudopeziza* leaf spot and of leafhopper yellowing, seed setting and other agronomic characters. All the parent-progeny correlations were significant, values for S_1 progenies being higher than those for polycross progenies. The yields of four-clone synthetics could be predicted from the yields of the polycross progenies of the clones but not from the average yields of the clones themselves. The following breeding programme is suggested: superior plants are selfed, undesirable lines and individuals are eliminated from the S_1 progeny, the remaining lines are allowed to interpollinate and the results of the polycross progeny tests are used to combine desirable clonal lines into synthetics.

2457 RIDGMAN, W. J., HANLEY, F. & BARKER, M. G.
Studies on lucerne and lucerne-grass leys. III. The effect of variety of lucerne and strain of grass.
J. agric. Sci. 1956 : **47** : 50–58.

An experiment has been carried out on the Cambridge University Farm, England, to compare the growth and productivity of six varieties of lucerne widely diverse in geographical origin, when grown in association with the cocksfoot strains S37 and S143 and with a commercial cocksfoot and timothy mixture. Variety of lucerne had a marked effect upon the following: establishment, persistence, recovery from defoliation, growth in early spring, yield of total dried produce, proportion of lucerne in this produce and N yield. No evidence was obtained of different degrees of compatibility of lucerne varieties with the grass strains or mixture.

2458 WILLEY, L. A. & ZALESKI, A.
Lucerne strains.
Mem. Grassl. Res. Inst. Hurley 1955 : No. 1 : 9–15.

A discussion is given of the results of (1) classification work on strains under conditions in England (cf. *PBA*, XXIV, Abst. 2094), (2) an analysis of the leaf-stem ratio in different types on the basis of green and dry weights (cf. *PBA*, XXV, Abst. 333), and (3) yield trials of strains. This work was carried out at the National Institute of Agricultural Botany, Cambridge, and in the case of (3) also at subsidiary centres.

2459 GREEN, J. O., COWLING, M. & ALDER, F. E.
A comparison of types of lucerne.
Mem. Grassl. Res. Inst. Hurley 1955 : No. 1 : 16–30.

A report is given of the results of experiments carried out at Drayton, Warwickshire, and at Hurley, Berkshire, England, to compare the performance of Du Puits, Provence, Marlborough, Canadian Grimm, Argentine and Ladak under a wide range of cutting treatments. It was concluded that in general an early type such as Du Puits offers more promise than a late type such as Canadian Grimm or midseason types such as Provence and Marlborough.

2460 ZALESKI, A.
Tripping, crossing and selfing in lucerne strains.
Nature, Lond. 1956 : **177** : 334–35.

Pilot investigations carried out at the National Institute of Agricultural Botany, Cambridge, England, in 1953 indicated that early strains (Eynsford, Du Puits, Chartrainvilliers and W268) had a higher number of florets per raceme and, under natural conditions, a higher percentage of florets tripped and pods set than midseason (Provence and New Zealand strain B) and late strains (Grimm and Rhizoma). Under cover, early strains also had a higher percentage of self-fertilized florets than midseason or late. These results were correlated with daily weather records in a highly significant manner.

More detailed investigations were subsequently carried out on Eynsford, Du Puits, Provence and Grimm, using the following treatments: (*a*) natural conditions of open pollination; (*b*) artificial tripping and selfing; (*c*) artificial tripping and crossing; and (*d*) selfing under cover in absence of insects. In (*a*) Eynsford and Du Puits had the highest number of florets per raceme, percentage of tripped florets and number of pods set, the differences between these strains and the other two being highly significant. Differences between Provence and Grimm were small. The two early strains also had a higher percentage of self-fertilized florets than Provence or Grimm in (*d*) but this difference was negligible in (*b*). Interstrain disparities in percentage of pods and seed number per pod set in (*c*) were slight but the difference between the early strains and Provence or Grimm in total number of seed set was considerable because the actual number of pods set in the former was higher. Early strains tripped artificially more easily than midseason or late. Honey bees, observed in great numbers on lucerne, cause accidental tripping, and possibly also cross pollination of automatically or wind tripped florets. Small insects may play a part in cross fertilization.

2461 GRAUMANN, H. O.
What do we mean by creeping alfalfas ?
Soil Conserv. 1955 : **21** : 103–04.

Differences among lucerne types with respect to crown development and spreading ability are described. In breeding creeping-rooted lucerne in the USA, use is being made of the Canadian variety Rambler and related stocks. Limited observations have indicated that the rhizomatous types may not express their spreading habit over as wide a range of soil and climatic conditions as creeping-rooted lucerne.

2462 SMITH, D.
Underground development of alfalfa crowns.
Agron. J. 1955 : **47** : 588–89.

Marked intervarietal differences in the proportion of crown branches growing underground were found in eight lucerne varieties. It is suggested that a well-developed system of rhizomes may be related to winter hardiness.

2463 DUDLEY, J. W. & WILSIE, C. P.
Inheritance of branched inflorescence and vestigial flower in alfalfa, *Medicago sativa*, L.
Agron. J. 1956 : **48** : 47–50.

A detailed account is given of investigations which have already been referred to in Abst. 1033.

2464 BROWN, J. W. & HAYWARD, H. E.
Salt tolerance of alfalfa varieties.
Agron. J. 1956 : **48** : 18–20.

California Common, Ladak, Turkestan, A204 Syn 1, India and Atlantic were grown at Riverside, Calif., for 3 years in plots salinized by irrigating with water containing 3000, 6000 and 9000 ppm. of a 50 : 50 mixture of sodium and calcium chlorides. The varieties showed no significant differences in yield (dry-weight of the tops) at the highest concentration. The average yield of all varieties was reduced to 79% of that of the control by the lowest concentration, 60% by the intermediate treatment and 42% by the highest concentration. California Common and India gave the highest yields at the control and lowest concentrations; with the intermediate treatment the yields of Turkestan and Atlantic exceeded those of the other varieties.

2465 SMITH, O. F.
Breeding alfalfa for resistance to bacterial wilt and the stem nematode.
Bull. Nev. agric. Exp. Sta. 1955 : No. 188 : Pp. 15.

In breeding lucerne at the Nevada Agricultural Experiment Station, Nemastan has been used as the chief source of resistance to stem nematode (*Ditylenchus dipsaci*) and bacterial wilt (*Corynebacterium insidiosum*). From among numerous selected plants, the five best individuals, chosen on the basis of the performance of their polycross progenies, were allowed to interpollinate to produce the synthetic variety Lahontan (cf. *PBA*, XXV, Abst. 2083) which equals Ranger in yield and is resistant to both disorders.

2466 STIVERS, R. K., JACKSON, W. A., OHLROGGE, A. J. & DAVIS, R. L.
The relationships of varieties and fertilization to observed symptoms of root rots and wilt of alfalfa.
Agron. J. 1956 : **48** : 71–73.

In an experiment in north central Indiana, the stand of Buffalo was poorer than that of Ranger or Grimm in the third year of cropping at the lowest rate of fertilizer treatment. Intervarietal differences were less marked at higher rates of fertilizer application. Stand was apparently related to the incidence of crown and root rot, chiefly due to *Ascochyta imperfecta*, *Sclerotinia trifoliorum* and *Fusarium* spp. In the fourth and fifth years, the stands and yields of Grimm became poorer, compared with those of Buffalo or Ranger at all rates of fertilizer treatment. This behaviour of Grimm was partly due to its susceptibility to bacterial wilt.

2467 **New alfalfa tolerant to aphid.**
What's New Crops Soils 1956 : **8** : No. 5 : p. 25.

Alfalfa strains resist aphid.
Ibid. 1956 : **8** : No. 5 : p. 25.

Sources of resistance to the yellow clover aphid have been found and some resistant experimental crosses and a tolerant synthetic variety have been produced by the USDA Entomology Research Branch and the New Mexico Agricultural Experiment Station.

2468 TAYLOR, N. L.
Pubescence inheritance and leafhopper resistance relationships in alfalfa.
Agron. J. 1956 : **48** : 78–81.

A detailed account is given of investigations, already referred to in *PBA*, XXV, Abst. **1749**, which have shown that resistance to leafhopper (*Empoasca fabae*) and the quantitatively inherited pubescence of the lucerne Hairy Arabian are associated. Use of this pubescence as a means of breeding resistant varieties is regarded as undesirable on account of (1) the difficulty likely to be encountered in transferring a quantitatively inherited character, (2) lack of winter hardiness in Hairy Arabian and (3) the probable occurrence of valuable types of resistance other than that due to pubescence.

2469 EVANS, A. M.
Correlation between grafting and hybridisation in the genus *Trifolium*.
Heredity 1955 : **9** : p. 417. (Abst.).

An account of the work here summarized appeared in *PBA*, XXV, Abst. **3135**.

2470 Forsøg med svenske rødkløverstammer. (**Trials of Swedish strains of red clover**).
Tidsskr. Planteavl 1955 : **59** : 725–26.

The results of yield trials of eight Swedish strains, including the two new tetraploids Svalöf 034 4*n* and Weibull's R28 4*n*, at nine Danish stations are reported.

2471 PANDEY, K. K.
Seed development in diploid, tetraploid and diploid-tetraploid crosses of *Trifolium pratense* L.
Indian J. Genet. 1955 : **15** : 25–35.

Embryo-sac development in the diploids and tetraploids was essentially similar, being of the monosporous 8-nucleate *Polygonum* type. Failure of the polar nuclei to fuse and occurrence of ovules without embryo sacs or with abnormal ones were however more frequent in the tetraploids. Poor seed set in 4*n* x 4*n* combinations was mainly due to collapse of the endosperm. In 2*n* x 4*n* and reciprocal crosses, the rate of endosperm development was much slower than that of the embryo; within 6–8 days after pollination the cell resources of endosperm had been used by the embryo; no conspicuous qualitative disturbance was however observed in the development of the endosperm. The data suggested that genetical differences exist among 4*n* individuals with respect to seed setting in 4*n* combinations.

2472 ZWINGLI, W.
Untersuchungen an Weissklee im Hinblick auf seine Züchtung. (**Studies on white clover with regard to breeding**).
Schweiz. landw. Mh. 1956 : **34** : 136–37.

Of material introduced into Switzerland from abroad the German variety Gigant [Giant], the English variety S100 and the Italian Ladino white clover Lodigiano have given the best results. Ecotypes from the Zürich region and other parts of Switzerland have been classified with respect to growth habit, yield and ability to compete with other plant species. Studies were carried out on the mode of inheritance of self sterility in white clover and a number of self fertile lines have been obtained by selection.

2473 DOVRATH, A.
(**White clover and the problem of legumes in irrigated pasture**).
Sadeh (Field)/Hassadeh 1955 : **35** : 603–04, 686–89. [Hebrew].

Varieties Ladino and Victoria-irrigation of *Trifolium repens* gave good results in experiments with legumes for irrigated pastures in Israel.

Some local wild strains of *T. repens* were collected and tried. These flower earlier than Ladino and yield more herbage during winter months. The strains from Sdeh-Nhemia and from Lehavoth-Habashan showed remarkably vigorous vegetative growth.

2474 YAMAMOTO, K.
(**On the F_1 of *Vicia sativa* x *V. angustifolia***).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 115–18. [Japanese].

In the present paper of this series (cf. *PBA*, XXV, Abst. 2106), a morphological and cytological description is given of the above hybrid. Meiosis is regular but fertility is reduced.

2475 HANSON, C. H. & COPE, W. A.
Interspecific hybridization in *Lespedeza*.
J. Hered. 1955 : **46** : 233–38.

A full account is presented of work reported in *PBA*, XXV, Abst. 823.

2476 BATES, R. P.
Effects of photoperiods on plant growth, flowering, seed production, and tannin content of *Lespedeza cuneata* Don.
Agron. J. 1955 : **47** : 564–67.

Differences in photoperiodic responses were found among eight strains, the characters studied being plant height, the length of the periods from planting to the production of chasmogamous and cleistogamous flowers and seeds, total seed production per plant and tannin content of the leaves. The 13-hour photoperiod produced fair growth and resulted in the most prolific flowering and highest seed production in all strains; no flowers were produced under a 14-hour photoperiod.

2477 MCALLISTER, D. R.
Breeding for low coumarin sweet-clover.
Fm. Home Sci. 1955 : **16** : 32–33, 41.

At the Utah Agricultural Experiment Station, crossing *Melilotus alba* with *M. dentata*, a species with low content of coumarin, and then back crossing to the former species as ♂, have resulted in promising biennial types from which the development of commercial selections low in coumarin content may be expected. The problem of the chlorophyll deficiency of the F_1 hybrids was overcome by grafting the seedlings on *M. officinalis*. High-coumarin annual white sweet-clover varieties such as Hubam and Emerald are to be crossed with low-coumarin biennial types to breed less toxic annual varieties.

2478 DAVIES, W. H.
Detection of coumarin in seeds involving crosses between two species of Melilotus.
Abstr. Thes. Utah St. Agric. Coll. 1955 : **3** : No. 3 : p. 8.

Details are given of a method of determining the coumarin content of seeds without impairing viability (cf. Abst. 1047). Each seed sample, taken from the cotyledons, was treated with 2 ml. of 2·5 N NaOH, dried lucerne leaf being added as a source of chlorophyll. After heating, the samples were evaluated for the colour of their fluorescence when exposed to ultraviolet light. After growth for 8 weeks, leaf tissue of the plants obtained from the sampled seeds was subjected to a similar test, except for omission of dried lucerne leaf. Coumarin determinations made from the seed and plant tests were highly correlated.

2479 ATABEKOVA, A. I.
(Hybrid lupins).
Izv. Timirjazev. seljskohozjaĭstv. Akad. (News Timirjazev agric. Acad.) 1955 : No. 2 : 129–34. [Russian].

Descriptions of the hybrids of *Lupinus mutabilis* x *L. ornatus*, *L. mutabilis* x *L. pubescens* and *L. hartwegii* x *L. elegans*, obtained by artificial crossing at the Timirjazev Agricultural Academy, are given. Some hybrids between the above species also arose spontaneously.

2480 TROLL, H.-J.
Erbgänge der Samenfarbe bei weisskörnigen gelben Süsslupinen (*Lupinus luteus*) und ihre Bedeutung für die Erhaltungszucht im Zusammenhang mit Weichschaligkeit und Leistungsfähigkeit. [**Modes of inheritance of seed colour in white-grained yellow sweet lupins (*L. luteus*) and their significance for stock maintenance in association with soft testa and yielding ability**].
Züchter 1956 : **26** : 41–53.

Crosses were carried out between the white-seeded varieties Weiko III and Gülzower Süsslupine [Gülzow Sweet lupin], both of which are derived from crosses between white-seeded mutants, found in 1932 and 1940 respectively, of Sengbusch's Süsslupine Stamm 8 [Sengbusch's Sweet lupin Strain 8] and the shattering-resistant Müncheberger Stamm 3535A [Müncheberg strain 3535A]. The F_1 seeds were white but all the F_2 seeds were speckled, showing that different genes for white testa, designated *niv* in the case of Weiko III and *alb* in the case of the Gülzower Süsslupine, are involved. Both genes are recessive. The gene *alb* affected only testa colour but *niv* was pleiotropic in its effect, resulting in reduced chlorophyll and anthocyanin contents. In the cross between plants carrying *alb* and those carrying *niv*, the morphological characters associated with *niv* were recessive. The value of the recessive *niv* in enabling the admixture of bitter lupins to be noticed as early as the seedling stage is pointed out. The importance of the character soft testa in lupins is discussed; extensive investigations failed to reveal any significant correlation between soft testa on the one hand and the factors *niv* or *alb* on the other, although plants with *niv* tended to have slightly softer testas than those with *alb*. A comparison of a number of different varieties showed hard testa to be a genetically determined character, varieties with small seeds tending to have a harder testa than varieties with large seeds. Yield trials indicated that plants with the factor *niv* grew less vigorously and gave slightly lower yields than those with *alb*. Plants carrying *alb* were also less sensitive to unfavourable environmental conditions.

2481 WEIN, K.
Die Geschichte von *Trigonella foenum-graecum* L. (**The history of *T. foenum-graecum* L.**).
Kulturpflanze, Berlin 1955 : **3** : 24–38.

The author rejects the hypothesis that *T. gladiata* is the ancestor of *T. foenum-graecum* and puts forward reasons for assuming that this latter species is derived from *T. haussknechtii*, a wild form found in the Near East, and was grown in the Tigris-Euphrates valley in the Babylonian era. It spread throughout the Mediterranean in pre-Roman times and was introduced into Gaul by the Romans. In the Middle Ages it was cultivated in Germany and later in other West European countries.

2482 TURNER, B. L.
Chromosome number in the genus *Sesbania* (Leguminosae): evidence for a conservative treatment.
Rhodora 1955 : **57** : 213–18.

S. exaltata, *S. drummondii* and *S. vesicaria* all have $n = 6$ chromosomes. The author does not favour allocating these species to different genera as proposed by some systematists.

ROOTS AND TUBERS

2483 JOSEFSSON, A.
Svalöfs rotfruktsstammar, en översikt. (**Svalöf root-crop strains—a survey**).
Allmänna Svenska Utsädesaktiebolaget, Svalöf 1956 : 36–38.

The yielding capacity and other characteristics of current strains and varieties of mangels, sugar mangels, swedes and turnips at Svalöf, Sweden, are briefly surveyed.

2484 SEDLMAYR, K.
A családtenyésztés kritikája különös tekintettel a *Beta vulgaris*ra. (**Criticism of family selection with special reference to *B. vulgaris***).
Növénytermelés 1954 : **3** : 33–36.

The selection of plants on the basis of the performance of their open-pollinated progeny is criticized on the grounds that (1) the pollen mixture is not uniform, (2) fertilization is selective and (3) heterotic effects in the progeny may obscure the heritable characteristics of different mother plants. It is held that this selection method is effective only during early stages of breeding, when the differences between mother plants are still sufficient to outweigh the above disadvantages.

2485 JOSEFSSON, A.
Resultat från försök med foder- och fodersockerbetor. (**Results of trials of mangels and sugar mangels**).
Sverig. Utsädesfören. Tidskr. 1955 : **65** : 387–401.

In trials carried out at various stations in Sweden during the period 1947–54, Nova II gave the highest yield of dry matter among four sugar mangels with low percentages of dry matter and Solid the highest yield among six high-percentage varieties; the four mangels tested differed little in yield of dry matter. In sugar mangels with a high percentage of dry matter, the roots tended to be longer, thinner and more angular, the storage quality to be better and the dry matter to contain a higher proportion of sugar than in low-percentage types.

2486 Voederbieten, 1956. (**Mangels, 1956**).
Landbouwvoorlichting 13 : Bijl. 3; Ber. Rassenkeuze 1956 : No. 200 : Pp. 7.

Tabulated data, based on trials held at different localities and on different types of soil, are presented for the main varieties grown in the Netherlands. The information given includes particulars of root and foliage yields, dry matter content and yield, tendency to bolting, keeping quality and ease of harvesting.

2487 KELLER, E. R.
Sortenversuche mit Futterüben. (**Forage beet variety trials**).
Mitt. schweiz. Landw. 1956 : **4** : 6–13.

The results of trials of eight foreign varieties at different centres in northern Switzerland in 1952–54 are reported. Rosa Beta and Ursus gave the highest weight of roots per ha. and Eureka had the highest dry matter and sugar contents and produced the highest yields of dry matter per ha. Rosa Beta producted most foliage. Eureka, Regia and Weisse Strynö [White Strynö] proved the most resistant to *Cercospora beticola*.

2488 HAHN, P.
Neue Gemüsesorten und ihre Anbaueigenschaften. 3. Kohlrabi. (**New vegetable varieties and their agronomic characteristics. 3. Kohl rabi**).
Dtsch. Gartenbau 1955 : **2** : 161–62.

Two new varieties recommended for cultivation in Germany are described. Blauer Schossfester [Blue Bolting-resistant] is an early-maturing variety similar to Nichtschiessender [Nonbolting] in appearance and possessing a considerable degree of frost resistance. It gives high yields of medium-large, round, pale-blue globes and is highly resistant to bolting and frost. Knaufs Ideal [Knauf's Ideal] matures earlier than most other varieties, is resistant to bolting and gives good yields of large, round, bright-blue globes. The large, fleshy leaves are erect to semierect. The principal defect of this latter variety is its susceptibility to cracking when fully ripe.

2489 HAHN, P.
Die Eignung der Kohlrabisorten für den Frühanbau im Gewächshausblock. (**The suitability of kohl rabi varieties for early cultivation in the greenhouse**).
Dtsch. Gartenbau 1955 : **2** : 246–48.

Rogglis Treib [Roggli's Forcing], Knaufs Ideal [Knauf's Ideal], Nichtschiessender [Nonbolting] and Blauer Schossfester [Blue Bolting-resistant] proved the most suitable varieties for forcing in the greenhouse in trials at the Central Station for Research on Varieties, Nossen, Germany.

2490 **Issue on varieties.**
Potato News Netherlands 1955 : **5** : No. 2 : 1–16.

Data are given on the parentage, yielding capacity, morphological characteristics, disease resistance, starch content and maturity group of each of the potato varieties included in the Netherlands official list of approved varieties for 1955 (cf. *PBA*, XXV, p. 104 and Absts. 2128 and 3173).

2491 **From crossing to list of varieties.**
Potato News Netherlands 1955 : **5** : No. 2 : 17–24.

The procedure followed in the Netherlands in testing new potato varieties prior to their inscription in the official list of approved varieties is outlined.

2492 Neunzehnter Tätigkeitsbericht der Vereinigung Schweiz. Versuchs- und Vermittlungsstellen für Saatkartoffeln (V.S.V.V.S) vom 1. November 1954 bis 31. Oktober 1955. [**Nineteenth report on the activities of the Association of Swiss Experimental Stations and Distributive Agencies for Seed Potatoes (VSVVS) from 1 November 1954 to 31 October 1955**] Pp. 28.

The above report is devoted to an account of the potato-growing industry in Switzerland and includes data on the varieties most widely cultivated.

2493 Résultats des essais réalisés hors de la métropole en 1955. (**Results of trials conducted outside Metropolitan France in 1955**).
Pomme d. Terre franç. 1956 : **19** : 7–13.

The results of official potato variety trials in Algeria, Morocco, Tunisia, Spain, Portugal, Greece and Switzerland are summarized briefly in order to give the French grower an insight into developments abroad.

2494 AVANZI, E.
Miglioramento genetico della patata in Italia e problemi relativi. (**Genetical improvement of the potato in Italy and related problems**).
Agricoltura ital. 1955 : **55** : 293–99.

The reasons for the low yields of potatoes in Italy, where the average is 70 c. per ha., are examined and the activities of the Centro Studi per la Patata [Centre for Studies on the Potato] are described. The first step was clonal selection of local varieties and selection of their seedlings. The first of the varieties produced by hybridization is S. Michele (cf. *PBA*, XXV, Abst. 359), which is proving capable of competing with any of the varieties introduced from abroad.

2495 Forsøg med kartoffelsorter 1951–54. (**Trials of potato varieties, 1951-54**).
Tidsskr. Planteavl 1955 : **59** : 729–32.

The results of a further year's trials have been included in this account of work of which a preliminary report was summarized in *PBA*, XXV, Abst. 2126.

Segunda Reunión de Papa realizada en la Estación Experimental de Balcarce 10 y 11 de mayo de 1954. (**Second Potato Meeting held at the Balcarce Experimental Station on 10 and 11 May 1954**).
Pergamino 1954 : Pp. 83. (Mimeographed).

The following contributions may be of interest to plant breeders.

2496 *Pasquale, D. R., Induni, C. J., Garay, C. A. & Calderoni, A. Estado actual de los trabajos de mejoramiento de papa que se conducen en Balcarce.* (*Present state of the work on potato breeding being carried out at Balcarce*). (*pp. 25–35*).

Indications are given of the varieties that have proved most successful for use as pollen or seed parents; Katahdin and Huinkul MA were among the best. Some lines selected from selfed seedlings of Huinkul MA excel that variety in resistance to scab and *Fusarium* and in tuber quality. Line P34–48 from DDV–4 x Huinkul MA has exceeded both Katahdin and Huinkul MA in preliminary yield tests.

A great number of the selected seedlings have a longer period of dormancy than Katahdin and hence better keeping capacity. Many of them are superior to Katahdin in yield and some in tuber quality.

2497 *Induni, C. J. Observaciones sobre la colección de papas de la Estación Experimental de Balcarce.* (*Observations on the potato collection of the Balcarce Experimental Station*). (*pp. 35–36*).

Observations have been made on a collection of 361 potatoes from different parts of South Africa, the USA and Europe. None of the imported varieties is of any use for cultivation but some are of interest for breeding.

2498 *Induni, C. J. Características cualitativas de la papa.* (*Qualitative characters of the potato*). (*pp. 37–43*).

An outline is given of the various properties that go to make up quality in potatoes. Determinations of specific weight, dry matter and starch contents were made on a collection of 96 varieties and the results are tabulated. The highest values for specific weight were found in European varieties and in certain forms of *Solanum andigenum.*

2499 *Calderoni, A. V. Comportamiento al marchitamiento o fusariosis* (Fusarium solani (*Mart.*) *App. et Wr. var.* eumartii (*Carp.*) *Wr.*) *en 60 variedades y clones de papa.* [*Reaction to wilt* (F. solani (*Mart.*) *App. et Wr. var.* eumartii (*Carp.*) *Wr.*) *in 60 potato varieties and clones*]. (*pp. 44–47*).

Tests of 13 varieties and 47 new clones with two races of the fungus, the results of which are tabulated, showed Katahdin and a number of seedlings to be relatively resistant whereas the popular variety Huinkul MA was susceptible.

2500 *Calderoni, A. V. Comportamiento a la sarna común* (Streptomyces scabies (*Thaxter*) *Waksman and Henrici*) *en variedades y clones de papa.* [*Reaction to common scab* (S. scabies (*Thaxter*) *Waksman and Henrici*) *in potato varieties and clones*]. (*p. 48*).

The ferric chloride method (cf. *PBA*, XXIV, Abst. 2163) has given results which agree with the known reactions of a number of varieties.

2501 Supplement 1956 waarin opgenomen supplement 1955. Geniteurslijst voor aardappelrassen 1954. **(The 1956 supplement, in which is included the 1955 supplement, to the list of the genetic origins of potato varieties, 1954).**
Comm. Bevord. Kivek. Onderz. nieuwe Aardappelrassen, Wageningen 1956 : Pp. 13.

The 1956 supplement to this reference book for potato breeders (cf. *PBA*, XXIV, p. 485) contains brief descriptions of 34 further varieties, including Ulster Dale (cf. *PBA*, XXI, Abst. 1175), Erntedank [Harvest Thanksgiving] and Professor Broekema (cf. *PBA*, XXIV Absts. 2159 and 3121), Saco (cf. *PBA*, XXV, Abst. 2189) and Crésus, Dalila, Électre, Érato and Eschyle (cf. *PBA*, XXVI, Abst. 1410). The following new varieties are also of interest; all are resistant to wart. Amyla (Flava x Strain BRA) is a midearly to midlate variety with a high starch content. It possesses good resistance to late blight and produces high yields of round tubers with shallow eyes and yellow flesh. Ancilla is a late maturing variety producing high yields of good quality tubers with light yellow flesh. It possesses good resistance to late blight. The Spanish variety Arana 168 (Institut de Beauvais [Beauvais Institute] x Erdgold [Earth Gold]) is a highly productive midlate variety producing long tubers with shallow eyes and white flesh. Goya (Institut de Beauvais x Flava) is a high-yielding, late-maturing variety possessing good drought resistance. Lori is distinguished by its resistance to late blight and virus diseases. Luctor [Orion x (Bevelander x Katahdin)] is a midlate variety giving high yields of good quality tubers with a high starch content. Meersteer [Sea Star] is a midearly to midlate variety with red skin. It is resistant to drought, virus A and streak virus. Olalla (Merkur x Valenciana) is a midlate, white-fleshed variety distinguished by its drought resistance. Pionier [Pioneer], from Noordeling x Record, gives high yields of starch and is resistant to spraing and streak virus. Prefect (Present x Frühmölle) also gives high starch yields and is resistant to leaf roll, spraing and late blight. Reaal [Real], from a complex cross involving *Solanum demissum*, is highly resistant to late blight and virus A. Regina (Libertas x Voran [Onwards]) gives high yields of large tubers with a high starch content. It is resistant to late blight. Rival (Record x Aquila) gives good yields of medium-sized tubers with a high starch content. It possesses factor *Rl* for resistance to late blight and is not susceptible to virus A. Surprise (Noordeling x Libertas) is highly resistant to several virus diseases; the tuber yield is high and the starch content good. Tedria, obtained from a complex series of crosses, is highly productive, possesses factor *Rl* for resistance to late blight and is resistant to drought. ZPC 45–2 (Aquila x Beetsma 38–19) gives high tuber yields, is resistant to late blight, leaf roll, virus Y and streak virus and has a high starch content. Other varieties described include Béa, Belle de Locronan [Locronan Beauty], Climax, Kwinta, Rival, Terena, Herkula and Norkota.

Abstracts of papers presented at the 39th annual meeting of the Potato Association of America held at East Lansing, Michigan, September 6-8, 1955.
Amer. Potato J. 1955 : **32** : 386–91 : 424–31.

2502 *Ayers, G. W. The resistance of potato varieties to storage decay caused by* Fusarium sambucinum *f6 and* Fusarium coeruleum. *(p. 386).*

A number of varieties showed moderate to high resistance to *F. sambucinum* 'f6.' Three of these varieties, Merrimack, Essex and Menominee, were among those classed as moderately to highly resistant to *F. coeruleum*.

2503 *Beamish, K. & Shejkal, J. The use of induced tetraploids in potato breeding. (pp. 386–87).*

Colchicine-induced tetraploids of $2n$ species and of interspecific hybrids of $2n$ species have been crossed with Katahdin. Hybrids between the natural tetraploid *S. stoloniferum* and induced tetraploids of *S. verrucosum* have so far failed to cross with Katahdin. Some of the *S. tuberosum* hybrids are being back crossed with Katahdin. All the $4n$ clones examined have shown multivalents and univalents; screening for cytological regularity is therefore necessary to avoid production of unbalanced gametes.

2504 *Casseres, E. H. Progress in cooperative potato improvement work in Costa Rica. (p. 387).*

Cooperation between the Inter-American Institute of Agricultural Sciences and Cornell University has resulted in the naming and introduction of Ticanel, Rosanel and Güetar, carrying R_1 for late-blight resistance (cf. *PBA*, XXIV, Abst. 3132). The institute and the Costa Rica Ministry of Agriculture have recently undertaken cooperative activities, including the multiplication of seed stocks of five more late-blight resistant types from the USA.

2505 *Dionne, L. A. Inducing and maintaining polyploids of* Solanum polyadenium. *(pp. 387–88).*

Mortality of colchicine-treated seedlings of *S. polyadenium* may be reduced by transferring them daily from a nutrient salt solution containing 20 g. of sucrose per l. to a simple mineral salt solution where they remain overnight. Daily transfer is continued until the appearance of true leaves. Terminal and leaf-bud cuttings of both the $2n$ and $4n$ forms root readily in vermiculite if protected by polyethylene film. Abundant tuberization of the tetraploids may be induced by grafting with scions of *S. tuberosum*.

2506 *Hooker, W. J., Peterson, C. E. & Thompson, N. R. Selection of leaf-roll resistant potatoes in the seedling stage. (p. 390).*

Selection for resistance to leaf roll and other aphid-borne viruses can be effected before the first tuber generation by exposing seedlings daily to infection by the insects immediately after transplanting. In breeding for combined resistance to diseases seedlings have been inoculated with virus and late blight. Survivors were then inoculated with leaf roll.

2507 *Hougas, R. W., Ross, R. W. & Beamish, K. I. Hybridization of certain tuber-bearing Solanum species. (p. 390).*

Late-blight resistant selections of *Solanum demissum* were successfully crossed with the following $2n$ species; *S. berthaultii*, *S. gibberulosum*, *S. gigantophyllum*, *S. goniocalyx*, *S. kesselbrenneri*, *S. phureja*, *S. rybinii*, *S. saltense*, *S. schickii*, *S. simplicifolium*, *S. soukupii*, *S. stenotomum*, *S. tarijense* and *S. yabari*. Crosses with *S. lanciforme*, *S. pinnatisectum*, *S. polyadenium* and *S. verrucosum* failed. In most of the F_1 hybrids, $2n = 48$ but some had $2n = 60$. A few polyhaploids of *S. demissum* ($2n = 36$) were found. Many hybrids were resistant to race 1, 2,3,4 of late blight. Vigorous hybrids were obtained by crossing F_1 combinations with *S. tuberosum* and *S. stoloniferum* but crosses with *S. acaule* failed.

2508 *Hoyman, W. G. A chamber with automatic temperature and humidity controls for testing resistance of potatoes to the fungus causing late blight. (p. 391).*

Details are given concerning a Bakelite chamber and its equipment.

2509 *King, J. R. Irish potato pollen storage. (p. 424).*

A progress report of continued experiments on the storage of pollen for short and long periods is given (cf. *PBA*, Vol. XXV, Abst. 2162). So far the highest degree of longevity has been obtained by storage at −30° F., without control of humidity.

2510 *Larson, R. H. Potato virus S—a new problem for the virologist, seedsman and breeder, a review. (pp. 424–25).*

The symptoms produced by virus S in potato varieties in Europe and problems raised by the occurrence of this new virus are briefly discussed (cf. *PBA*, XXIII, Abst. 2802). Virus S may be widespread among the older varieties in the USA.

2511 *Rieman, G. H., Cooper, D. C. & Young, D. A. The Hindenburg russet character in relation to scab. (p. 426).*

Evidence has been obtained suggesting that in the variety Hindenburg the major genes for scab resistance are linked with those for the flaked type of russeting.

2512 *Schark, A. E., Peterson, C. E. & Carlin, F. A. The influence of variety on the specific gravity—mealiness relationship of potatoes. (p. 427).*

In an evaluation by a taste panel of three judges, varietal differences in scores for mealiness of the cooked product, when corrected for variation in specific gravity of the tuber samples, were highly significant. Some factor other than specific gravity therefore also influenced evaluation of mealiness. A significant linear relationship was found between mealiness scores and specific gravity. The mealiness scores showed no significant differences due to judging and interactions of judge x variety and judge x specific-gravity class.

2513 *Sheehan, J. E. & Odland, T. E. A quarter century of potato variety testing in Rhode Island. (p. 428).*

Comments are made on variety testing during 1930–54. It is pointed out that although many of the newer varieties are high yielding they are inferior in quality to some of the older ones.

2514 *Stevenson, F. J. Breeding varieties of potato resistant to diseases and insects. (p. 429).*

Desirable characters isolated from mutants and interspecific hybrids and used in breeding in the USA are indicated. Information is also given on the economic role of the varieties released as the result of the national breeding programme.

2515 *Webb, R. E., Akeley, R. V. & Stevenson, F. J. Leaf roll resistance in* Solanum tuberosum *L. (p. 429).*

Katahdin, Matador, Imperia and Keřkov Triumf [Triumph] were readily infected with leaf roll by aphid inoculation in greenhouse tests. Six out of 19 seedlings were highly resistant to inoculation by aphids and tuber-plug grafts, X927–3 showing most resistance. This seedling was also highly resistant under field conditions. The leaf-roll resistance of B2834–3 appeared to be partially due to its resistance to the vector. High temperatures at critical stages may appreciably reduce the leaf-roll resistance of X927–3 and other seedlings.

2516 *Witz, R. L. Equipment to measure the resistance of potatoes to pressure, abrasion, and impact bruising. (p. 431).*

Information is provided on equipment for testing varietal resistance to different types of bruising of the tubers.

The National Potato-Breeding Program, 1954.
US Dep. Agric. 1955 : Pp. 216. (Mimeographed).

The following work in connexion with breeding is of interest. Many of the contributions deal solely with yield trials of varieties and seedlings in 1954 and are here omitted. Seedlings which have reached the status of commercial release are noted in Absts. 2517 and 2545.

2517 *Stevenson, F. J. National potato-breeding program,* 1954. *(pp. 1–3).*

A short survey is given of the results of testing named and seedling varieties for yield, total solids content and resistance to major diseases. Reference is also made to investigations on *Solanum* spp. and hybrids.

Seedlings B73–18, B355–44 and B606–67 have been released as, respectively, Delus (cf. *PBA*, XXV, Abst. 2146), Merrimack (cf. *PBA*, XXV, Abst. 3205) and Saco (cf. *PBA*, XXV, Abst. 2189). Plymouth (B73–10) is shortly to be released for eastern North Carolina and Boone (NC B880–4) for the western part of this state.

United States Department of Agriculture.

2518 *Stevenson, F. J.* et al. *Plant Industry Station (Beltsville, Md.) and Chapman and Aroostock Farms (Presque Isle, Maine). (pp. 4–11).*

Crosses effected at the Plant Industry Station included many designed to give varieties with multiple resistance to diseases and pests.

2519 *Akeley, R. V., Stevenson, F. J., Folsom, D. & Bonde, R.* Verticillium *wilt resistance.* (*pp. 11–14, 15*).
Ontario, Russet Burbank, S41956, B579–3, X792–88, X792–94 and B920–7 showed less than 10% *Verticillium* wilt in a test on infested soil at Caribou, Maine. As in previous years, however, yield and percentage infection were not correlated.

2520 *Buck, R. W. (Jun.).* Solanum *species and species hybrids.* (*pp. 14, 16*).
Species and interspecific hybrids of *Solanum* were investigated with respect to their crossability and cytology. No details of the species used are provided.

2521 *Webb, R. E.* et al. *Late blight resistance.* (*pp. 16–21*).
Many hybrid seedlings showed immunity from the common race of late blight under field conditions. Most of their parents are resistant or immune to other important diseases.

2522 *Webb, R. E., Akeley, R. V. & Stevenson, F. J. Resistance to brown rot.* (*pp. 21–22*).
Forty-six selections and five varieties displayed a high degree of resistance or immunity to brown rot when artificially inoculated.

2523 *Webb, R. E. & Buck, R. W. Reaction of some* Solanum *species to virus Y and* Verticillium albo-atrum. (*pp. 22–24*).
Most of the 30 species and interspecific hybrids tested developed typical symptoms of virus Y when sap-inoculated by a moderately virulent strain. Plants of three species and three hybrids produced local lesions, followed by top necrosis or typical mottling. *S. schickii* proved to be a symptomless carrier.
S. chacoense, *S. gibberulosum*, *S. caldasii* x *S. commersonii* and *S. chacoense* x Menominee were highly tolerant of *Verticillium albo-atrum*. *S. parodii*, *S. macolae*, *S. schickii* and *S. caldasii* x Katahdin failed to be become infected with this pathogen and are to be retested.

2524 *Schultz, E. S., Webb, R. E., Akeley, R. V. & Stevenson, F. J. Virus A resistance.* (*pp. 24–26*).
A number of hybrid seedlings combined field immunity from virus A with a high degree of resistance to other diseases.

2525 *Schultz, E. S., Webb, R. E., Akeley, R. V. & Stevenson, F. J. Virus X resistance.* (*pp. 26–29*).
When inoculated mechanically or by grafting, many hybrid seedlings were immune from virus X. Their parents possess immunity or a high degree of resistance to one or more other diseases.

2526 *Akeley, R. V. & Stevenson, F. J. Varietal reaction to net necrosis.* (*pp. 29–30*).
Of the named varieties tested, Early Gem, Houma, Katahdin and Saco remained free from net necrosis and stem-end browning.

2527 *Schaal, L. A., Frutchey, C. & McAnelly, C. Colorado (Fort Collins).* (*pp. 31–34*).
Some hybrid seedlings were retained for further testing on account of their resistance to scab and other desirable features.

2528 *Hougas, R. W. & Ross, R. The Inter-regional Potato Introduction Project.* (*pp. 35–37*).
Species included in the collection of the Inter-Regional Potato Introduction Station, Sturgeon Bay, Wis., are listed. Stocks showing resistance to race 1,2,3,4 of *Phytophthora infestans* and stocks classed as resistant to *Pseudomonas solanacearum* are also indicated.

2529 *Kehr, A. E. North central regional potato trials* 1954. (*pp. 38–43*).
Information is provided on the performance of named and numbered varieties not only with respect to yield and total solids content but also maturity and other characteristics. Scab reactions varied markedly according to locality.

2530 *McLean, J. G. Pacific Northwest.* (*pp. 44–46*).
Results obtained at Rexburg, Idaho, suggest that a high degree of field resistance to *Verticillium* wilt has been bred into some white-skinned lines. Moderately resistant russet types have been obtained but further crossing is required for the enhancement of resistance.
No correlation was detected between leaf-roll resistance and aphid resistance.
A highly significant correlation of —0·477 was obtained between scab reactions and results from the $FeCl_3$ test for chlorogenic acid in the periderm.

2531 *Dykstra, T. P. Southern project.* (*pp. 47–50*).
The chief aim of breeding is the development of early red-skinned varieties resistant to both scab and late blight and well-adapted in the deep south.
A new technique of collecting and storing pollen, developed at Louisiana State University, was used in making crosses in the field at the Cumberland Plateau Experiment Station, Crossville, Tenn. Lack of sufficient pollen has hitherto been a limiting factor.

A method of testing seedlings for resistance to *Streptomyces scabies* by inoculation effected by growth in vermiculite containing the pathogen again proved satisfactory (cf. Abst. 2594).

2532 *Edmundson, W. C. U.S.—Colo. Potato Field Station* (*Greeley, Colo.*). (*pp. 51–53*).
Breeding of red and white varieties with scab resistance and improved cooking quality continued.

Alaska

2533 *Dearborn, C. H.* (*pp. 55–57*).
The behaviour of 16 of the newer American varieties is briefly described. Most of them are unsuited for Alaska.

California

2534 *Davis, G. N.* (*pp. 58–62*).
Observations on the resistance of seedlings to scab in Kern County and to *Verticillium* wilt in San Benito County are recorded.

Canada

2535 *Ayers, G. W. & Akeley, R. V.* (*p. 63*).
Of the seedlings tested in Prince Edward Island for reaction to *Verticillium* wilt and storage rot (*Fusarium sambucinum* f6), B2368–4, X792–88 and X792–94 exhibited resistance to the former and B353–35 and B355–44 (Merrimack) to the latter.

Florida

2536 *Eddins, A. H.* (*Hastings*). *Corky ring-spot.* (*pp. 74–72*).
For the fourth year in succession the USDA seedlings B73–10, B294–65, B355–44, B381–2, B595–76, B606–3, B721–1 and B926–6 remained free from corky ring spot.

Iowa

2537 *Kehr, A. E., Hooker, W. J., Peterson, C. E. & Schark, A. E.* (*pp. 75–77*).
Progress was made in developing seedlings combining resistance to two or more major diseases.

2538 *Schark, A. E. Factors related to cooking quality in potatoes.* (*pp. 77–78*).
The relationship between specific gravity and mealiness was investigated (cf. Abst. 2512). A general association was detected between discoloration of the raw sliced tubers upon exposure to air for 24 hours and colour of the cooked potatoes. Seedling selections showed a wide range of differences in discoloration of the raw slices; ability to remain white after peeling may be required in the processing of ready-to-cook potatoes.

Louisiana

2539 *Miller, J. C. & King, J. R.* (*pp. 79–83*).
Crosses made among named varieties and the most promising seedlings at Louisiana State University during 1954 are listed. Methods of storing pollen for short and long periods are being investigated (cf. Absts. 2576 and 2578). The white-skinned selection 91–258 (Green Mountain x Katahdin), an early-maturing oblong russet type, is shortly to be named and introduced. Of the red-skinned seedlings to be retained for further breeding, 82–94, 92–93 and 92–167 are scab resistant; the last-mentioned is also late-blight resistant.

Maine

2540 *Bonde, R., Stevenson, F. J., Akeley, R. V. & Merriam, D.* (*pp. 84–85*).
The ring-rot resistant seedlings B721–29, B2854–1 and B2117–2 combined high yields and high solids content.

2541 *Simpson, G. W. & Bonde, R. Leaf-roll-resistant seedlings.* (*pp. 86–88*).
B24–58 is particularly valuable as a parent conferring resistance to leaf roll.

Mexico

2542 *Niederhauser, J. S., Cervantes, J. & Servin, L. Report on 1954 Toluca* (*Mexico*) *field test for late blight resistance of seedlings sent by Dr. F. J. Stevenson.* (*pp. 95–98*).
Approximately 200 seedlings out of 4747 were selected as showing some degree of resistance to very severe infection. Ac25953 and Ac25949 have proved to be the best parents with respect to late-blight resistance.

Michigan

2543 *Thompson, N. R., Moore, H. C. & Peterson, C. E.* (*p. 99*).
Progress was made in breeding for disease resistance and other improvements.

Minnesota

2544 *Krantz, F. A.* et al. *Races of late blight.* (*pp. 101–04*).
In addition to the four races of *Ph. infestans* already known to occur in Minnesota (0; 1; 4; 1,4), a fifth (2,4) has been obtained from selection 3AB–2.
Selections are undergoing progressive screening tests for combined resistance to late blight, scab and virus X under field conditions.
Hybrids of *S. tuberosum* with *S. demissum*, *S. stoloniferum*, *S. chacoense*, *S. phureja* and *S. rybinii* are being studied with regard to disease

and insect resistance and hybrid vigour. Two introductions of *S. demissum* (PI160221 and PI161181) behaved as inbreds when crossed, giving a highly vigorous F_1. The progeny of PI197767 (Epicure x 4*n* *S. chacoense*) x scab-resistant *S. tuberosum* exhibited marked resistance to leafhopper.

Nebraska

2545 *Werner, H. O.* (*pp. 113–23*).
By raising plants with all their vegetative parts above ground and rubbing off the stolons or tuberiferous buds as they developed, good flowering was induced in lines ordinarily blooming scantily or not at all. Seed pieces were planted in a ridge of gravel on top of an inverted 2½-inch pot; when the plants were about 10 in. tall the gravel was washed away to below the seed pieces.

Progress is being made in developing red-tuber lines with both scab resistance and satisfactory internal colour. White-tuber varieties and selections have been used as sources of scab resistance. Cayuga is an outstandingly good parent with regard to tuber type, specific gravity and scab resistance but contributes poor internal colour and the russet characteristic to most segregates.

An attempt is being made to devise techniques to evaluate drought resistance. Varieties differed in ability of the leaves to retain a high percentage of water under drought conditions.

Redglo was released (cf. *PBA*, XXV, Abst. 365). Its complex parentage includes Katahdin, Lookout Mountain, Peerless and Pontiac.

The following selections are being increased for possible release: 26.44.1, a midseason potato with red tubers possessing high specific gravity and particularly desirable market characteristics; 91.47.1, a midseason line with medium-red tubers; and 223.48–IX, an early to midseason selection with round russet tubers of good commercial type. The two last-mentioned are highly resistant to scab.

New York

2546 *Kelly, W. C.* (*pp. 130–34*).
Investigations begun nearly ten years ago to study the effects of genetical and environmental factors upon ascorbic acid content are surveyed. B2098–29 (Mohawk x B355–24) is particularly valuable as a parent in transmitting the character of high content. Selection KB1277–1 containing 30 mg. per 100 g. fresh weight, i.e. almost double the concentration to be found in the best commercial varieties at present available, has been developed by selfing B2098–29 (20 mg.).

2547 *Livermore, J. R.* (*pp. 135–36*).
Crossing to produce an early-maturing, high-yielding and high-quality variety continued. Frequent use as a parent is being made of the leaf-roll resistant seedling B24–58.

2548 *Peterson, L. C., Pieringer, A. P. & Alfieri, A. S.* (*pp. 140–41*).
Seedlings involving *S. demissum* in their pedigrees have been tested for late-blight resistance under greenhouse conditions, one objective being the determination of the possible additive effect of increasing dosages of genes for resistance. Some of this breeding material has also exhibited scab resistance.

When inoculated with virus Y, mechanically or by aphids, the following types of reaction were observed among seedlings: hypersensitivity to one strain but systemic infection by others; hypersensitivity to several strains but systemic reaction to only one; and hypersensitivity to all strains.

A few selections resistant to black spot, due to bruising, and also to late blight are undergoing yield trials.

Only two species, *S. sucrense* ($2n = 48$) and *S. vernei* ($2n = 24$), are sufficiently resistant to *Heterodera rostochiensis* for use in breeding. The reaction of four collections of *S. andigenum* to this nematode accorded with reports of their resistance in Europe (cf. *PBA*, XXV, Abst. 2185).

North Dakota

2549 *Hoyman, W. G.* (*pp. 146–64*).
Testing of local and federal seedlings for reaction to scab, virus Y and late blight is reported. Hybrid progenies were screened for immunity from virus X. Information is given on the disease reactions, colour and maturity of many red-skinned selections developed in various parts of the USA.

2550 *Schultz, J. H. & Johansen, R.* (*pp. 165–71*).
Breeding for disease resistance continued. ND457–1 transmits a high level of field resistance to virus Y to its progenies.

Ohio

2551 *Sleesman, J. P.* (*pp. 172–73*).
Approximately two-thirds of the progeny of (*S. chacoense* x Menominee) x Cherokee were highly resistant to leafhopper. The resistant seedlings were however undesirable in other respects; only a few were saved for further study. Resistance of *Solanum* spp. to leafhopper and flea beetle is due to antibiotic action.

Washington

2552 *Locke, S. B.* (*pp. 196–97*).
In tests of reaction to leaf roll in three localities, B579–3 was the least infected on the average, followed by WP94, Katahdin, WP31 and WP57 in order of increasing infection.

Washington

2553 *Vincent, C. L.* (*pp. 200–02*).
CS11751, CS11875, CS12360 and B2368–4 showed promise as scab-resistant selections at the Irrigation Experiment Station, Prosser.

West Virginia

2554 *Gallegly, M. E.* (*pp. 203–05*).
A complete set of differential hosts involving the genes R_1, R_2, R_3 and R_4 for resistance to *Ph. infestans*, singly and in all possible combinations, is being built up. Use of hosts possessing only a single *R* gene is however being considered as an easier method of racial identification than testing a large number of hosts containing all combinations of *R* genes. Ways of separating race mixtures into their components by means of single-gene hosts are discussed.
Races (1,2,3), (1,2,4), (1,3,4), (2,3,4) and (1,2,3,4) are being used to determine the *R* genotypes of *Solanum* spp. and F_1 clones of hybrids of *S. demissum* with $2n$ species. This screening is being carried out in cooperation with the Scottish Plant Breeding Station. At least two dominant genes, distinct from R_1–R_4, have been identified in *S. demissum*.

2555 *Westover, K. C. & Marvel, M. E.* (*pp. 206–09*).
Selections showing late-blight resistance in various field tests carry R_1 or R_2, in some cases combined with genes for resistance to one or two of several other diseases.

Wisconsin

2556 *Larson, R. H. & Akeley, R. V. Incidence of physiological internal tuber necrosis.* (*p. 210*).
NC880–4 remained free from the above condition in a test in central Wisconsin.

Wyoming

2557 *Riedl, W. A., Rincker, C. M., Vaughn, J. R. & Arnold, G. W.* (*pp. 213–16*).
Crosses were effected between red-skinned seedlings and adapted commercial varieties resistant to scab and ring rot.

2558 ESTRADA RAMOS, N.
Resumen de investigaciones en papa, 1955. (**Summary of investigations on potatoes in 1955**).
Agricultura trop. 1955 : **11** : 921–23.
Several thousand hybrids were made in the Colombian programme of breeding for improved yield, blight resistance or earliness. The highest yields among the hybrids were obtained from seedlings of Branca cascuda [Thick-skinned White] x Pana blanca [White Plush], Branca cascuda x Bijagua, Branca cascuda x Guasca, Quincha x Tocana colorada [Coloured Tocana] and Paspuela x Leona; some of them are earlier and more blight-resistant than the common varieties Tocana, Tequerreña and Ojona.

2559 ODRIOZOLA, M.
La Estación de Mejora de la Patata. Organización a partir de 1948. (**The Potato Breeding Station. Organization since 1948**).
ASPAS, Madr. 1955 : No. 17 : 5–8.
In an account of the work of the Spanish research station for potato breeding since the author became director in 1948, reference is made to a number of new varieties ready for release, most of them hybrids in which one of the old-established Spanish varieties figures as one of the parents. In consideration of the vast amount of work done in other countries on breeding potatoes for resistance to blight and virus diseases, the activities of the station are being directed more especially to breeding varieties possessed of short vegetation periods and tolerance of drought, two properties of particular importance for Spanish conditions.

2560 DODDS, K. S.
Positional pseudo-alleles in diploid potatoes.
Nature, Lond. 1955 : **175** : 394–95.
A preliminary report is given of the positional effect detected between B^c and I which, when coupled, result in the nodal bands characteristic of the action of B^d (cf. Abst. 2561).

2561 DODDS, K. S. & LONG, D. H.
The inheritance of colour in diploid potatoes. II. A three-factor linkage group.
J. Genet. 1956 : **54** : 27–41.
"Three loci, *B*, *I* and *F*, concerned with the distribution of anthocyanins in diploid cultivated potatoes, are identified. Alleles $B^d > B^c > B^b > B^a > b$, in order of dominance, are distinguished.
"B^d produces in the seed a band of pigment on the node of the hypocotyl of the embryo and, in the mature plant, a band of pigment at each node, a coloured floral abscission layer and a coloured eyebrow on the tuber.
"With B^c, a band of pigment at each node of the mature plant is absent, but other effects are like those of B^d.

"*Bb* gives a coloured floral abscission layer and a coloured eyebrow on the tuber. With B^a only the floral abscission layer is coloured.
"Locus *I* in its homozygous recessive phase, *ii*, inhibits pigment in the tuber.
"Locus *F* in its homozygous recessive phase, *ff*, gives flecked flowers.
"The three loci are closely linked and probably in the order *B–I–F*.
"B^c and *I*, in coupling, give a positional effect so that the characteristic nodal bands of B^d occur. Locus *B* appears to be a super-gene.
"The suggestion is made that the proximity of these loci is original and functional. It may facilitate intergenic co-operation in the distribution of pigment." (cf. *PBA*, XXV, 2150).

[Authors' summary]

2562 KAWAKAMI, K. & TAKAYAMA, A.
Studies on the species differentiation in *Tuberarium*. I. Morphological analysis of *S. longipedicellatum* and *S. chacoense* and triploid hybrid between them.
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 69–74.

A detailed comparative morphological study was made of the above two species and their F_1 hybrid. As a rule, characters derived from *S. longipedicellatum* tended to be dominant over those derived from *S. chacoense*.

2563 SAÑUDO PALAZUELOS, A.
Problemas de cruzabilidad. (**Problems of crossability**).
ASPAS, Madr. 1955 : No. 17 : 18–21.

A brief review of the literature on the influence of chromosome number on the success or failure of interspecific crosses in *Solanum* is followed by a reference to experiments which have been undertaken at the Estación de Mejora de la Patata [Potato Breeding Station] in Spain, in which certain species from sections *Pinnatisecta* and *Commersoniana* have been crossed with other species by the use of Swaminathan's method of decapitating the stigma.

2564 ENGEL, K. H.
Untersuchungen an reziproken Kreuzungspopulationen von Kulturkartoffeln. (**Investigations of populations of cultivated potatoes from reciprocal crossings**).
Züchter 1956 : **26** : 33–36.

On the basis of studies of the F_1 and later generations of the crosses Merkur x Aquila, Robusta x Wega, Frühmölle x Capella and their reciprocals the author concludes that there is no statistically reliable evidence of extranuclear inheritance in crosses between cultivated varieties of potato.

2565 GLUŠČENKO, I. E. & SLAVINSKAJA, N. V.
(**Genetical heterogeneity of tissues and clonal selection in the potato**).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1955 : **40** : 136–58. [Russian].

Recent experiments on the development of new forms of potato from artificially-induced adventitious buds are described (cf. *PBA*, XVII, Abst. 743). Some strains thus obtained, in particular those from tubers of Zarnica [Dawn] (= Lichtblick), showed improved yield and vigour and an increased starch content.

2566 LINNIK, G. N.
(**Causes of degeneration in the potato**).
Bot. Ž. (Bot. J.) Moskva 1955 : **40** : 528–41. [Russian].

Arguments against two theories of degeneration in potatoes, one attributing it to viruses and the other to external conditions, are presented. The author holds that degeneration is caused by the old age of the tuber tissues and describes methods for propagating regenerated tubers. The decisive operation is digging early, preferably at full bloom and at any rate not later than the end of the flowering period. The author's thesis is supported by evidence from his own experiments on a number of potato varieties.

2567 BUESA, J.
Práctica de la selección en Iturrieta. (**The method of selection at Iturrieta**).
ASPAS, Madr. 1955 : No. 17 : 33–36.

The method of clonal selection practised at the Potato Research Station in Spain is described; the criteria are freedom from virus diseases, habit and size, form, number and yield of tubers.

2568 **Clonal selection and seed potato growing.**
Windmill, The Hague 1955 : No. 18 : 13–14; (also in French, 11–13; German, 14–15; Spanish, 15–16; and Italian, 16–17).

An account is given of the procedure followed in the Netherlands as regards clonal selection and the production of seed potatoes. The significance of the categories S, SE, A, B and C is explained (cf. *PBA*, XXIV, Abst. 423).

2569 RATERA, E. L.
Número de cromosomas de *Solanum stuckertii* Bitter. (**Chromosome number of *S. stuckertii* Bitter**).
Bol. Soc. arg. Bot. 1954 : **5** : 153–54.

An examination of the pollen mother cells showed that $n = 12$.

2570 GOTTSCHALK, W. & PETERS, N.
Das Konjugationsverhalten partiell homologer Chromosomen. (**The behaviour at conjugation of partially homologous chromosomes**).
Chromosoma 1956 : **7** : 708–25.

Meiosis in the pollen-mother cells of a triploid hybrid ($2n = 36$) obtained by crossing *Solanum ajuscoense* ($2n = 48$) with *S. stenotomum* ($2n = 24$) was studied to obtain information on the degree of homology exhibited by the genomes and individual chromosomes of the parent species. The behaviour of the chromosomes at pachytene provided the only reliable information in this respect, behaviour at diakinesis and metaphase proving difficult to assess. Partially heterologous gemini occurred at pachytene side by side with normal bivalents. In eight out of nine instances only the heterochromatic region was affected in this way; in the ninth case the structural changes extended to the border area between heterochromatin and euchromatin. Centromeres and euchromatic zones were normal in every respect and the regular pairing of chromosomes in the euchromatic region showed them to be fully homologous. Univalents and associations of 3 homologous chromosomes were also observed at pachytene. On the basis of the above findings it is concluded that structural chromosome changes that have occurred in the past and have played a role in the differentiation of individual species in the genus *Solanum* have taken place mainly in the heterochromatic segments and rarely, if ever, in the euchromatin.

2571 BARTOŠ, J.
Dělení buněk a jader při tvorbě hojivého peridermu na hlízách bramboru (*Solanum tuberosum*). [**Division of cells and nuclei in potato tubers (*Solanum tuberosum*) during periderm formation**].
Čsl. Biol. 1955 : **4** : 478–79.

BARTOŠ, J.
[**The division of cells and nuclei in the tubers of the potato (*S. tuberosum*) at periderm formation**].
Folia biol., Praha 1955 : **1** : 313–15. [Russian].

It was found that the nuclei divided normally. Cells without nuclei or with several nuclei, amitosis and cell division by sulcation, reported by some Soviet writers, were not observed.

2572 LEBEDEVA, N. A.
(**The production of polyploids of some wild potato species**).
Bot. Ž. (Bot. J.) Moskva 1955 : **40** : 575–83. [Russian].

This account of experiments at the Institute of Plant Industry on *S. punae*, *S. schreiteri* and *S. gibberulosum* mentions, among other technical details, the concentrations of colchicine solutions regarded as the optimum for each of these species. Most of the treated plants showed retarded growth and differed morphologically from the controls. But the surviving polyploids, on selfing, gave progenies notable for health and vigour. The polyploid plants of *S. punae* were all alike and bred true. They had 96 chromosomes, were partially sterile and formed tubers under short days. The tubers were double the size of the untreated form. The polyploids of *S. schreiteri* were similar to those of *S. punae*. The colchicine-treated plants of *S. gibberulosum* showed very great variability with regard to most biological and morphological characteristics. Polyploids 110, 111 and 113, regarded as the most interesting among the 18 forms that were selected, are described. Plants 110 and 111 have 48 chromosomes and produce tubers under long days. Plant 113 has 96 chromosomes. It is vigorous, resembles *S. tuberosum* and also forms tubers in long days. The tubers are nearly twice as large as those of the control. Many colchicine-treated plants of *S. gibberulosum* were malformed and proved to be sterile. This is accounted for by uneven chromosome numbers.

Biochemical analysis of the polyploids of all the three species referred to revealed an appreciable increase in demissin.

2573 ZUBELDIA LIZARDUY, A.
Obtención de variedades precoces. (**Production of early varieties**).
ASPAS, Madr. 1955 : No. 17 : 25–27.

Studies of the development cycle have been made in a number of early varieties of potato at the Potato Research Station in Spain. The varieties found most suitable for use as pollen parents in breeding for earliness are Oberarnbacher Frühe [Oberarnbach Early] and Katahdin, with Allerfrüheste Gelbe [Yellow Earliest-of-all] as seed parent.

2574 STEINECK, O.
Die photoperiodische Reaktion von "Schosser"-Stauden der Sorte Erstling. (**The photoperiodic reaction of bolters of the variety Erstling**).
Z. Pflanzenz. 1955 : **35** : 137–48.

When submitted to photoperiods of 12–14 hrs. bolter strains of the above potato failed to flower but produced higher yields of tubers and were morphologically more similar to normal Erstling plants than when grown under a 16-hr. photoperiod. It is postulated that the occurrence of bolters is due to a mutation of the gene controlling photoperiodic response. Bolters grown under normal-day conditions produced few tubers but an abundance of flowers, as did also normal Erstling plants subjected to a photoperiod of about 18 hr. It is suggested that, in the case of certain varieties which produce few or no flowers, bolters may be of value in breeding as such plants would tend to produce more flowers and thus lend themselves more readily to crossing. Alternatively, such varieties could be subjected to extremely long photoperiods in order to encourage flowering.

2575 GILLES, A. & DEVREUX, M.
Recherches cytogénétiques sur les *Solanum*, section *Tuberarium*. II. Pollinisation et fécondation. (**Cytogenetical investigations on *Solanum*, section *Tuberarium*. II. Pollination and fertilization**).
Agricultura, Louvain 1955 : **3** : 451–60.

Using Gineke as ♀ and Katahdin as ♂ parent the period between pollination and fertilization was found to vary from 20 to 24 hrs. depending on the length of the style (cf. Abst. 1419).

2576 KING, J. R.
Observations on the use of bags and on emasculation in potato pollination.
Amer. Potato J. 1955 : **32** : 466–67.

Bagging after emasculation and rebagging after pollination protected the pistils from the effects of hot weather in experiments at Baton Rouge, La. The bags could be kept on for several days with little, if any, adverse effect upon seed set. A higher percentage of seed balls was obtained from pollinations of emasculated flowers than from pollinations without emasculation, regardless of the time of day when emasculation and pollination were performed and regardless of whether or not an interval of time separated these two operations.

2577 LINDNER, K., JASCHIK, S., KORPÁCZY, I., POLNER, R. & VÁRDI, P.
A magyar burgonya táplálkozási értéke. (**The nutritional value of the Hungarian potatoes**).
Növénytermelés 1954 : **3** : 261–80.

The information presented in this article includes analytic data on the content of vitamin C, dry matter, ash, starch and nitrogen in six Hungarian varieties.

2578 KING, J. R.
Irish potato pollen storage.
Amer. Potato J. 1955 : **32** : 460–66.

A report is given of further investigations on pollen storage at the Department of Horticultural Research, Louisiana State University, Baton Rouge (cf. *PBA*, XXV, Abst. 2162). For storage from one season to the next, storage at −30° F. (humidity not controlled) has given the best results, according to germination percentages. Storage at 35° F. and 18·8% relative humidity has produced the next best results, followed by storage at 35° F. and 27·4% relative humidity. The unreliability of the determination of viability by germination on artificial media is stressed. A more satisfactory test has not however yet been devised. Results from pollination, under field conditions, with pollen stored from the previous season have been promising. Routine transportation of viable pollen for long distances, exchanges of fresh or stored pollen and the establishment of collections of potato pollen for distribution among breeders are now within reach. One of the problems requiring cooperative investigation is varietal disparity in pollen behaviour.

2579 Die stärkereichen Kartoffelsorten. (**Potato varieties rich in starch**).
Kartoffelbau 1956 : **7** : p. 4.

Tabulated data are presented on the relative starch contents, yields of tubers and starch per ha. and soil requirements of 6 midearly, 12 midlate and 6 late varieties.

2580 HÖPPNER, E. & GEIDEL, H.
Ertrags- und Stärkeleistungen der im Verkehr befindlichen geschützten Kartoffelsorten. (**Yield and starch yields of registered potato varieties in commercial production**).
Kartoffelbau 1956 : **7** : 43–45.

HÖPPNER, E. & GEIDEL, H.
Stärkeleistungen der im Verkehr befindlichen geschützten Kartoffelsorten. (**Starch yields of registered potato varieties in commercial production**).
Stärkekartoffel 1956 : **1** : No. 2 : 2–3.

In trials in Western Germany during 1950–55 the midearly variety Suevia and the midlate to late varieties Capella and Herkula proved superior in respect of starch percentage and total yield of starch per ha.

2581 Zadina, J. & Sixta, J.
Vztah mezi škrobnatostí a výnosy u průmyslových odrůd bramborů. (**Correlation between starch content and yield in industrial potato varieties**).
Sborn. čsl. Acad. zeměd. Věd Řada rostlinná Výroba : 1956 : **29** : 173–80.

At Havlíčkův Brod, data on the yield and starch content of a number of varieties were analysed; high yield and high starch content were negatively correlated.

2582 Ubillos, M.
Obtención de las primeras variedades de la Estación. (**Production of the first varieties of the Station**).
ASPAS, Madr. 1955 : No. 17 : 22–24.

The Potato Research Station in Spain has made a number of crosses with the object of producing a red-skinned potato with yellow flesh, capable of replacing Red Kidney. A list of the crosses effected is given and reference is made to five of the seedlings which are to be released. These are Turia, from Cernegula x Regina, Victor, from Robijn x Industrie, Goya and Mari, from Cernegula x Flava, and Olalla, from Merkur x Pedro Muñoz.

2583 Ermakov, A. I. & Lukovnikova, G. A.
(**A rapid method of determining crude protein in potatoes and cabbage**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 263–69. [Russian].

The method described consists in digesting macerated tissues of the plants concerned with 37·5% solutions of caustic soda and measuring the ammonia released by means of an indicator tube, containing a mixture of powdered glass, powdered agar, sulphuric acid and congo red, suspended above the solution in a closed flask. Determinations made by this method correspond sufficiently closely to those from Kjeldahl analysis to serve as a basis for selecting for high protein content.

2584 Fischnich, O.
Lagertemperatur und Keimstimmung von Kartoffelpflanzgut. (**Storage temperature and conditioning of sprouting in seed potatoes**).
Kartoffelbau 1956 : **7** : 52–56.

Optimum storage temperatures for potatoes in the West German list of approved varieties were determined. It was found that all the varieties could be assigned to one of three groups, viz. potatoes with an optimum storage temperature of 4° C., those with an optimum storage temperature of 7° C. and those that kept best at 7° C. but were relatively insensitive to any temperature between 1 and 10° C.

2585 Hawkes, J. G.
Taxonomic studies on the tuber-bearing Solanums. 1: *Solanum tuberosum* and the tetraploid species complex.
Proc. Linn. Soc. Lond. 1956 : **166** : 97–144.

A monographic review of the taxonomy of *S. tuberosum* is presented. The tetraploid taxa *S. maglia* vars. *guaytecarum* and *chubutense*, *S. leptostigma*, *S. molinae*, *S. andigena*, *S. herrerae* and *S. subandigena* are now regarded as conspecific with *S. tuberosum*. Highly uniform F_1 and F_2 progenies have been obtained from the crosses *S. andigena* x *S. leptostigma* and *S subandigena* x *S. andigena*. *S. tuberosum* is thought to have arisen from a diploid cultivated species, most likely *S. stenotomum*; *S. sparsipilum* also appears to be closely related.

2586 Gell, P. G. H., Wright, S. T. C. & Hawkes, J. G.
Immunological methods in plant taxonomy.
Nature, Lond. 1956 : **177** : p. 573.

A preliminary report is given of the application of immunological analysis to the classification of *Solanum* spp. Using *S. tuberosum* and *S. ehrenbergii* antisera, well-marked cross reactions occurred among the 40 species tested. By comparison of the "line spectra" obtained on agar plates by the precipitates formed between the diffusing tuber extracts and antiserum, and by means of data on cross absorptions of the antisera, it was possible to divide the species into five groups which, with one exception, each corresponded to taxonomic series proposed by Hawkes. The correspondences between the groups and taxonomic series were as follows: group 1, *Morelliformia*; 2, *Pinnatisecta*; 3, *Cardiophylla*; 4, *Demissa* and *Longipedicellata*; and 5, *Bulbocastana*.

2587 Zubeldia Lizarduy, A., López Campos, G. & Sañudo Palazuelos, A.
Estudio, descripción y clasificación de un grupo de variedades primitivas de patata cultivadas en las islas Canarias. (**Study, description and classification of a group of primitive varieties of potato cultivated in the Canary isles**).
Bol. Inst. Invest. agron., Madr. 1955 : **15** : 287–325.

Information is cited which would indicate that the potatoes of the Canary isles were introduced direct from Peru in the early part of the seventeenth century. The potatoes grown today in many areas ranging from 400 to over 1000 m. in altitude have been studied and ten varieties are described and illustrated. One of them, known as Negra [Black], proved to be triploid, with $2n = 36$; the rest were tetraploid but six of them were in all respects typical of *Solanum tuberosum* subsp. *andigenum*; one was typical of *S. tuberosum* subsp. *chileanum* and the others were intermediate in character. The triploid does not conform to any existing triploid species though in certain respects it has affinities with *S. mamilliferum*. The discovery of this material is thought to add further support to the view that the domestic potato originated from Peruvian *S. tuberosum* subsp. *andigenum* rather than being introduced from Chile.

2588 Black, W.
Trends in potato breeding in Great Britain.
Euphytica, Wageningen 1955 : **4** : 223–26.

The chief current objective is improved cooking quality combined with increased resistance to virus, wart, blight, scab and root eelworm.

2589 Šubina, O. G.
(**Breeding hardy potato varieties**).
Agrobiologija (Agrobiology) 1955 : No. 6 : 60–64. [Russian].

Breeding varieties with leaves as tolerant of frost as *Solanum acaule* is reported from Sverdlovsk. The account deals with the difficulties presented by low fertility of the hybrids of *S. acaule* x *S. tuberosum* and wild characteristics or low tuber yields of their progenies. The tuber yield of Hybrid 2 (*S. acaule* x Jubel) in later generations was increased by hybridization with other domestic varieties but only at the expense of frost resistance. Moreover the tubers produced by the multiple hybrids were malformed. The only form having practical value was obtained by grafting Lorh on Hybrid 2 and then fertilizing the grafted hybrid by the pollen of unspecified domestic varieties. The new form, Sejanec 6259 [Seedling 6259], is notable for resistance to scab and for high vitamin C, starch and protein contents. However its tuber yield is appreciably below that of the standards Lorh and Épron.

2590 López Campos, S.
Obtención de variedades tolerantes de la sequía. (**Production of varieties tolerant of drought**).
ASPAS, Madr. 1955 : No. 17 : 28–30.

Studies of the root system and other characters have been made with a number of old-established Spanish potato varieties when grown under conditions of low soil humidity in the open near Burgos and in the greenhouse. Crosses have been made with the most promising of these varieties and with varieties of *Solanum andigenum*, *S. stenotomum* and other South American species and their hybrids. The seedlings are grown in pots and submitted to tests in which 50% of the plants wilt.

2591 Pantjuhina, L. & Čubova, A.
(**Determining the resistance of potato varieties to bacterial diseases**).
Zemledelie (Agriculture) 1955 : No. 12 : 82–84. [Russian].

An account of infection trials at the Rusinovič breeding station mentions new varieties showing resistance to bacteria. Minsk is resistant to *Corynebacterium sepedonicum*, Ptičj to black leg (*Erwinia carotovora*) and Rusinovič to both.

2592 **New potato varieties announced.**
What's New Crops Soils 1955 : **8** : No. 3 : p. 24.

Antigo is a scab-resistant, medium early variety with smooth white tubers suitable for mechanical harvesting (cf. Abst. 2593). Red Beauty has smooth, shallow-eyed tubers of better shape and colour than those of older red varieties.

2593 Rieman, G. H. & Young, D. A.
Antigo: a new white, medium-maturing potato variety resistant to common scab.
Amer. Potato J. 1955 : **32** : 407–10.

In addition to the above characters, Antigo has a total solids content similar to that of Katahdin, satisfactory yielding ability and suitability for mechanical harvesting. It was developed at the Wisconsin Agricultural Experiment Station from a cross between Menominee and Wis. 302.44–6 [Wis. 6–119 (Irish Cobbler x Katahdin) x Wis. 13–253 (Chippewa x Hindenburg)]. It is especially adapted to muck soils in Wisconsin.

2594 Dykstra, T.
A new method for screening first-year potato seedlings for scab resistance.
Phytopathology 1956 : **46** : 57–58.

By planting potato seeds in vermiculite uniformly infected with *Streptomyces scabies*, information on the scab resistance of seedlings may be obtained a few months after sowing.

2595 **Agricultural Research in Scotland in 1953. Scottish Plant Breeding Station.**
Trans. Highl. agric. Exp. Sta. 1954 (1955) : **66** : 64–66.

A review is given of breeding and genetical work carried out on the potato at the above station during the period 1948–53 in connexion with resistance to late blight, virus diseases, scab and eelworm.

2596 TEDIN, O.
Växtförädling och växtskydd. (**Plant breeding and plant protection**).
Sverig. Utsädesfören. Tidskr. 1955 : **65** : 309–22.

This is a full version of the paper presented at the annual meeting of the Swedish Seed Association in 1955 (cf. Abst. 116).

2597 DOLING, D. A.
Distribution of physiological races of *Phytophthora infestans* (Mont.) de Bary in Northern Ireland.
Nature, Lond. 1956 : **177** : p. 230.

Seven races were identified among isolates from commercial varieties and *Solanum tuberosum* x *S. demissum* hybrids. Only race 4, however, has a widespread distribution.

2598 POOS, J. A. J.
The autumn-raising of potato-seedlings in the open.
Euphytica, Wageningen 1955 : **4** : 211–14.

The practice of raising potato seedlings in autumn is advocated as an effective means of testing for blight, since heavy natural infections tend to occur late in the year. Moreover, autumn-raised crops contained few or no tuberless plants with thick stolons, such as are found frequently among spring-sown potatoes.

2599 Forsøg med tidlige, brokimmune sorter af spisekartofler 1950–53. (**Trials of early wart immune varieties of potatoes, 1950-53**).
Tidsskr. Planteavl 1955 : **59** : p. 723.

This is a shortened version of the report summarized in Abst. 504.

2600 AKELEY, R. V., STEVENSON, F. J., FOLSOM, D. & BONDE, R.
Breeding varieties of potato resistant to *Verticillium* wilt in Maine.
Amer. Potato J. 1956 : **33** : 15–21.

Progenies of crosses between selfed lines have exhibited significant differences in field reaction to *V. albo-atrum*. Differences have also occurred among advanced selections and named varieties. A particularly high degree of resistance has been shown by the seedling variety 41956 (GS9–1 x 24642) and its derivatives. The sister varieties Ontario and Menominee possess resistance. In Maine, only nonsignificant negative correlations have been detected between heavy infection and high yield, but in Idaho highly significant negative correlations have been invariably found.

2601 SZIRMAI, J.
Túlérzékenységi reakció felhasználása a burgonya X-virus elleni nemesítésben. (**Use of the hypersensitive reaction in breeding potatoes resistant to virus X**).
Növénytermelés 1954 : **3** : 209–14.

At the Budapest Research Institute for Plant Protection, material derived from symptom-free plants selected from highly susceptible F_1 clones varied in susceptibility. After four years' selection, two strains originating from Krüger x Flava and Wohltmann x Edelgard, respectively, contained a high proportion of plants with resistance resulting from hypersensitivity.

2602 FOLSOM, D.
Testing potato seedling varieties in Maine for field resistance to leafroll and for desirable horticultural characteristics.
Amer. Potato J. 1955 : **32** : 372–85.

The results of testing over 16,000 seedling varieties for leaf-roll resistance and other characters during 1938–48 are surveyed. In field-resistance tests at Highmoor Farm, one of the resistant seedlings, B24–58, showed only 7% on the average for 8 years. Leaf-roll resistance was higher in seedlings derived from crosses of two resistant parents than in those whose parentage involved only one resistant type, but the value of resistant seedlings as parents varied considerably. Use of a checkerboard design involving many control plots of commercial varieties was valuable for early testing of resistant seedlings for yield and other commercial characters. Inherited resistance to mahogany browning and virus X was noted. Differences were observed among the seedling varieties in degree of susceptibility to hopperburn. Resistance to *Myzus persicae* was not related to leaf-roll resistance. Usually field exposure to leaf roll was a less severe test than artificial inoculation by aphids; the latter test was therefore apt to eliminate seedlings suitable for breeding or commercial use. Seedlings showing resistance in Maine also exhibited this reaction elsewhere. In trials under commercial conditions, the early-maturing seedling X1276–185 (Katahdin x Houma) has proved superior to Chippewa in some respects. In the field-resistance tests at Highmoor Farm, X1276–185 developed on the average 19% leaf-roll infection.

2603 TIMIAN, R. G., PETERSON, C. E. & HOOKER, W. J.
Immunity to virus X in potato: selection of immune plants in the breeding program.
Amer. Potato J. 1955 : **32** : 411–17.

Mass inoculation by spraying seedlings with an inoculum-carborundum mixture when two true leaves were showing proved effective for the identification of susceptible plants in investigations at the Iowa Agricultural Experiment Station. Symptomless survivors were transplanted to 3-inch pots in the greenhouse and, when well established, were inoculated by hand, plants developing local or systemic symptoms being discarded. Selections subsequently showing suitable commercial characters in field plantings were inoculated a third time and also tested by the serological method for identifying symptomless carriers.

2604 WETTER, C. & BRANDES, J.
Untersuchungen über das Kartoffel-S-Virus. (**Investigations on potato virus S**).
Phytopath. Z. 1956 : **26** : 81–92.

Particles of virus S measured approximately 652 μ in length and 12–13 μ in breadth. Three groups of physiological races were distinguished on the basis of their ability to cause necrosis on *Gomphrena globosa* and tomato plants. Virus S may be identical with the paracrinkle virus.

2605 YANG, C. T.
(**Report on the results of regional trials of sweet potatoes**).
Nungyeh Yenchiu/Agric. Res., Taipei 1954 : **5** : No. 1–2 : 44–89. [Chinese].

Three-year trials of ten varieties in five different localities in Taiwan are reported. The characteristics studied were yield of overground shoots, yield and size of tubers, yield of tuber slices and flavour of tubers. The best varieties were the hybrids K140 (Tainung [Taiwan Agriculture] 31 x Early Butter) and 76 (Tainung 37 x Nancy Hall) from the Chiayi research station.

2606 KUWADA, H. & YAMAMOTO, K.
(**On the progenies of chimerical sweet potatoes obtained by vegetative propagation**).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1953 : **5** : 42–45. [Japanese].

Data are given on the frequency of pink, cream-coloured and particoloured roots in vegetatively propagated lines of the variety Okinawa 100. There was a greater tendency for pink-rooted plants to give rise to pink-rooted offspring than for corresponding behaviour by the cream-rooted plants. This difference may be due to differential mutation rates of the genes responsible for pink and cream coloration respectively.

2607 MENEZES, O. B. DE
III. Melhoramento da batata dôce. Resistência à ferrugem branca e à broca. (**III. Sweet-potato breeding. Resistance to white rust and weevil**).
Ceres, Minas Gerais 1954 : **9** : 256–64; and Bol. Sec. Agric. Pernambuco 1954 : **21** : 28–32.

In this contribution (cf. *PBA*, XXIV, Abst. 3141) brief descriptions are given of 61 varieties of sweet potato grown in Brazil, followed by tabulated data on their reaction to *Albugo ipomoeae-panduratae* and *Euscepes postfasciatus* respectively. Thirty-five varieties proved immune from white rust and 12 from the weevil.

2608 FUJIKAWA, T. & KOSUGI, Y.
(**Studies on the sweet potato disease caused by *Corticium centrifugum*. I. On varietal differences in the susceptibility of sweet potato to *C. centrifugum***).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1951 : **1** : 68–69. [Japanese].

Data are provided on the relative susceptibility of 12 varieties to the above pathogen. Norin [Ministry of Agriculture and Forestry] 4 was the most resistant variety.

2609 NISHIZAWA, T. & MIZUTA, H.
(**Studies on the sweet potato disease caused by *Fusarium solani*. IV. On a varietal trial in respect of resistance to this disease**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1951 : **1** : p. 62. [Japanese].

Ten Japanese sweet-potato varieties were classified in respect of their resistance to the above pathogen. The early variety Norin [Ministry of

Agriculture and Forestry] 9 was the most resistant.

FIBRES

2610 Zanini, E.

La selezione e mantenimento in purezza di nuove stirpi di cotone per il Mezzogiorno. (**Selection and purity maintenance of new cotton strains for southern Italy**).

Sementi elette 1955 : **1** : No. 2 : 32–38.

A brief historical account is given of the types of cotton grown in Sicily since its introduction there by the Arabs in the ninth century, AD. Of the varieties introduced more recently, the most successful have been Acala, Rowden and Stoneville 4 and 5A; improved forms of several of these varieties have been obtained by selection for such properties as yield and quality of lint, earliness or uniformity in material that had been introduced several decades ago and become very impure through intercrossing.

These selections give better results than most introductions from abroad and measures are proposed for the prevention of further deterioration by outcrossing.

2611 Adžabjan, A.

(**Promising cotton varieties from Armenia**).

Hlopkovodstvo (Cott.-raising) 1956 : No. 2 : 43–45. [Russian].

Descriptions are given of new varieties bred at the Institute of Industrial Plants, including A16 (an early selection of King-Karajazskiĭ x S 450–555) and A 354, which was obtained by single plant selection among the progeny of an open-pollinated form from the USSR Institute of Plant Industry (Collection Item 3542). The new varieties outyield the standards 108F and 1298 and show greater earliness than 108F and produce larger bolls than 1298. They are also characterized by high ginning percentages and good length and quality of fibre.

2612 Simlote, K. M.

Research notes. Inheritance studies of maturity of fibre and its coarseness in upland cotton.

Indian Cott. Gr. Rev. 1955 : **9** : 154–55.

Information is given on some projects at the Institute of Plant Industry, Indore, Madhya Bharat.

Cotton. Investigations on fibre quality in the Upland variety Buri 107 have indicated that in plants with green fuzz and green lint, the fibre has the lowest maturity, highest degree of silkiness and highest wax content (cf. Abst. 2616). The combination white lint : green fuzz is intermediate in fibre maturity and feel. The highest degrees of maturity and coarseness are found in plants with white lint and white fuzz.

A chart is given indicating linkages of the *li* genes for lintlessness in Asiatic cottons with genes for lint colour and other characters.

The progeny of a possible chimera for susceptibility and immunity to wilt (unspecified) is being studied.

Other crops. Sorghum collections outyielding IP3, a white-grained and lax-headed type, are to undergo selection.

The rice Burwani 22 has proved to be most satisfactory with respect to earliness. Selection of varieties for growing under rainfed conditions is to continue.

2613 Bhola Nath

Research notes. Plant breeding.

Indian Cott. Gr. Rev. 1955: **9** : 155–57.

Data are provided on (1) the yield and fibre properties of strains already developed and (2) the hybrid material at the Institute of Plant Industry, Indore, where breeding of desi and American cottons for the Malwa area is carried out.

2614 Kalyanraman, S. M., Ramaswami, V. & Vaman Bhatt, M.

Acclimatisation trials with Sea Island cotton in the west coast of Madras State.

Indian Cott. Gr. Rev. 1955 : **9** : 167–88.

Trials of the varieties St. Vincent and Montserrat in Malabar and South Kanara demonstrated that Sea Island cotton can be successfully cultivated as an unirrigated pure crop, Montserrat being preferable to St. Vincent. Reselection for yield, ginning percentage and fibre maturity in both varieties was unsuccessful. The yield of Montserrat is however uneconomic and its quality somewhat too high for use in most Indian mills. The variety has therefore been crossed with higher-yielding Sea Island cottons with lower quality, such as Westberry, Andrews and SI White Flower, with a view to selecting a suitable type. F_1 hybrids may also offer a means of increasing yield and lowering quality; F_1 Cambodia Co.2 x Montserrat has shown promise.

2615 Venkoba Rao, M., Seshadri Ayyangar, G. & Jagannath Rao, C.

Improvement in staple and ginning under the White Northerns scheme.

Indian Cott. Gr. Rev. 1955 : **9** : 197–200.

An historical survey is given of the improvement of the trade cotton White Northerns in Andhra.

Since 1949, breeding has been carried out to develop strains superior in staple length and ginning percentage to N14, a commercial selection obtained as the result of earlier work. Hybrid selections improved with respect to the two characters have been secured and at present breeding is aimed at increasing the lint yield of these selections.

2616 **Progress Report of the Institute of Plant Industry, Indore, Madhya Bharat, for the year ending 31st May, 1955** : Pp. 75.

Cotton. The scheme to develop desi cotton for Malwa, superior to Bhoj in yield and spinning and ginning performance, continued (cf. *PBA*, XXV, Abst. 2843). Malvi 17 (Malvi 9 x Jarila) was superior to Bhoj in halo length and fibre strength but not in yield and ginning outturn. Strains I53–1204 and I53–1205 (Bhoj x Pratap) equalled Bhoj in lint properties; their superiority in yield over Bhoj was not however significant. Some strains showed a high degree of resistance to *Fusarium vasinfectum* in both field and greenhouse tests. Crosses of Malvi strains and Bhoj with South Indian types, and their back crosses, are being selected.

In work on American cotton, a varietal trial showed Indore 5 to be superior in yield and ginning percentage to Indore 2.

Selection for jassid resistance and other characters was effected in crosses and back crosses involving (1) Indore strains and other improved Indian cottons and (2) Indore strains and East African types. Interspecific crosses of various parentages were unsatisfactory as regards yield and jassid reaction. Menoufi was crossed with Quabradinho to ascertain the possibilities of growing perennial *Gossypium barbadense* hybrids. The combination khaki lint : khaki fuzz is independently inherited of green and white lint and fuzz, various assortments of which are dependent upon a multiple allelic series. Study of the genetics of the khaki lint : green fuzz phenotype, found in some *G. hirsutum* types from Central America, was initiated. The combination green lint : green fuzz is associated with a high degree of fibre immaturity and low lint percentage, compared with white-lint strains. This association appears to be due to linkage and not pleiotropy.

The gene li_d in *G. herbaceum* var. *wightianum* is homologous with the gene for short lint in *G. arboreum* race *indicum*. Govande has reported that li_d is linked with the locus for leaf shape (cf. *PBA*, XV, Abst. 833); the above homology was therefore tested by linkage data. Short lint and leaf shape segregated independently; the chromosome segments in which the loci in question are situated therefore appear to differ in the two species.

Correlation between staple length and yield per plant was positive in all crosses in most generations from the F_7 to F_{12}, although usually the correlation was not high.

2617 García, U. C. *et al.*
Comportamiento de variedades y nuevas selecciones de algodón en la Argentina en 1950–1953. (**Behaviour of varieties and new selections of cotton in Argentina in 1950-53**).
Rev. Invest. agríc. B. Aires 1955 : **9** : 229–308.

Extensive tabular data are presented concerning the behaviour of 29 cotton selections, together with 4 introduced varieties, when tested in all the main cotton-growing areas of the Argentine Republic. Properties of the lint, and oil and protein content of the seed were determined as well as yields of lint and seed. The results show that selection Sáenz Peña 61 is outstanding in yield and earliness, particularly in the Chaco area; other varieties with satifactory yields were J. Brebbia, Las Breñas 16 and Colonia Mascías 6769. The best marks for quality were given to the upland variety Catamarca 72, other good varieties being J. Brebbia, El Colorado 1L, Deltapine 15 and Stoneville 2B; in certain areas Colonia Mascías 6769 has also been placed in the group with superior lint properties. In the western region with lower rainfall Las Breñas 341 received favourable mention for both yield and lint percentage. In the irrigated zone the best average yields were given by J. Brebbia 83, which was notably superior to Deltapine 15 and Stoneville 2B in both yield and quality of fibre; among the upland varieties, Güemes 87 and Catamarca 321 were the best in yield, Güemes 87 and Güemes 82 in fibre quality.

Recommendations of the best varieties for growing in each of the main regions complete the report.

2618 Gadkari, P. D.
A brief review of studies carried on breeding genetics, botany statistical methods in breeding and general improvement of cottons at the Institute of Plant Industry, Indore (1927-53).
Bull. Inst. Pl. Industr. Indore undated : No. 9 : Pp. 38.

Most of the investigations surveyed have already been referred to in *Plant Breeding Abstracts* in summaries of the relevant papers and annual reports. Some unpublished results are however mentioned. During the 25-year period under review the following characters have been studied genetically: chlorophyll deficiencies, sterility, crumpling, hairiness, leaf shape, anthocyanin pigmentation, corolla colour, petalody, size and other characters of the boll, lintlessness, fuzziness, resistance to *Fusarium* wilt, jassid and red leaf, and lint properties. Other lines of investigation reviewed include cytology, interspecific hybridization, induction of mutants by X rays, taxonomy, botanical surveys, natural selection in present-day populations, evolution within the genus *Gossypium*, field experimentation, breeding techniques, methods of evaluating technological properties, and lastly, breeding for the Mewar and Gang Canal regions.

2619 BHAT, N. R.
Some points deserving consideration in the breeding and pure seed multiplication of cottons in India.
Indian Cott. Gr. Rev. 1955 : **9** : 189–95.

In this survey of techniques designed to retain some genetic variability in developing a cotton variety, the view is expressed that the "bulked progeny test" described by Richmond is the most suitable for adoption in India (cf. *PBA*, XXII, Abst. 2062). Testing of breeding material is discussed in relation to genotype-environment interactions and suitability for commercial conditions. Modifications in the method of seed multiplication used at present in Bombay State are suggested as means of maintaining sufficient genetic variability to prevent deterioration in agronomic characters but without detrimental effect upon technological properties.

2620 BHAT, N. R. & PATEL, C. T.
A dominant (twin-bolled) 'cluster' in hirsutum cotton.
Curr. Sci. 1956 : **25** : p. 29.

In (Co.2 x Pima) F_1 x BC 68, the character of twinned bolls behaved as a dominant but in some segregates its expression was modified to normal as the result of the presence of an inhibitor.

2621 STEPHENS, S. G.
Linkage in upland cotton.
Genetics 1955 : **40** : 903–17.

Of eighteen marker genes tested in 110 of the possible 153 paired combinations, seven lay at independent loci and the remainder fell into four linkage groups, the remaining 15 chromosomes of the full complement of 26 being unmarked. There appeared to be a tendency for the mutant loci to be concentrated in certain chromosomes, but the data were insufficient to provide statistical confirmation of this. A provisional gene map for linkage group 1 ($N - Lc_1 - yg_2 - R_2$) has been constructed, the data being in agreement with the assumption, based on metaphase I observations, that the centromere is median or submedian and that, on the average, only one chiasma is formed in each arm.

2622 THAKAR, B. J. & SHETH, D. S.
Commercial production of hybrid seed in Bombay State.
Indian Cott. Gr. Rev. 1955 : **9** : 120–22.

The view is expressed that the demand for the production of cotton with extra long staple in Bombay State may be partly satisfied through use of F_1 hybrid seed. The importance of simultaneous flowering of the parents is emphasized. Co.2 ♀ x Montserrat Sea Island ♂ has shown promise under certain conditions in the Surat and Karia districts (cf. *PBA*, XXIII, Abst. 2073). At Broach, Co.2 has flowered later than the ♂ parent; an early selection of 134 x Co.2 x Mead may be more suitable as ♀ parent.

2623 WEAVER, J. B. (JUN.)
Endosperm development in interspecific crosses in *Gossypium*.
J. Elisha Mitchell sci. Soc. 1955 : **71** : p. 173. (Abst.).

In crosses involving Asiatic, American and synthetic hexaploid cottons, the endosperm was the first tissue to show abnormalities. In crosses of the type low chromosome number (♀) x high chromosome number (♂), the endosperm made rapid initial growth but degenerated 10–20 days after pollination without developing cell walls. The greater the difference in chromosome number the more rapid the degeneration. Dumb-bell nuclei, due to amitosis or bridge formation, were frequent. The embryo often reached once-fifth the normal size but did not differentiate properly; the maternal tissue of the ovule developed in an almost normal manner. In the reciprocals, except $6n$ x $4n$, the endosperm formed cell walls prematurely and ceased growth after 5 days, whereas the embryo grew at a normal rate for 10 days. The maternal tissue ceased growth immediately after the endosperm. When the egg cell was not fertilized, however, the endosperm grew at a normal rate, a large embryoless ovule being produced. The endosperm in embryoless ovules apparently stimulated the growth of embryos in adjacent degenerating ovules.

2624 GERSTEL, D. U.
A pollen mother cell of Asiatic cotton with only ten pairs of chromosomes.
Cytologia, Tokyo 1955 : **20** : 197–98.

One pollen mother cell containing only 10 pairs of chromosomes instead of 13 was detected in material obtained by back crossing *Gossypium arboreum* x *G. herbaceum* to *G. arboreum.* No explanation of this phenomenon could be suggested.

2625 HARLAND, S. C.
The use of haploids in cotton breeding.
Indian J. Genet. 1955 : **15** : 15–17.

Information is given on the natural occurrence of haploids in *Gossypium barbadense, G. hirsutum* and hybrids between these species, as observed by the author. Ways in which haploids may be useful in breeding and in the study of mutation rates and other genetical problems are concisely indicated.

2626 PARDO PASCUAL, M.
Aportaciones al conocimiento de variedades interesantes de algodón para los regadíos aragoneses. (**Contributions towards the knowledge of interesting cotton varieties for irrigated zones in Aragon**).
Bol. Inst. Invest. agron., Madr. 1955 : **15** : 375–22.

Data are given on date and duration of flowering, fruit formation and dehiscence, yield of raw cotton and of seed, ginning percentage, lint length and seed germination in four varieties recently introduced from the USA and four others that have been in cultivation in the Aragon region for some time. The four local varieties gave the highest yield of raw cotton per hectare, the best being Esparta and Andalucía, followed by Chirpan and, at some distance, Paymaster; the American varieties Empire and Fox were considerably lower in yield, Stoneville 3.202 and Plains being lower still. The local varieties were earlier in flowering and boll dehiscence and though their lint was shorter than that of the American varieties they are considered more suitable for the area in question.

2627 SIMPSON, D. M. & DUNCAN, E. N.
Varietal response to natural crossing in cotton.
Agron. J. 1956 : **48** : 74–75.

When 79 varieties and strains were planted in alternate rows with DeRidder Red in 1954 at Knoxville, Tenn., they underwent 29–60% natural crossing. Two groups of eight varieties and strains, representative of high and low amounts of natural hybridization respectively, were chosen from among these 79 cottons for further testing in 1953 and 1954. Percentages of crossing in 1951, 1953 and 1954 for the high group were 54, 51 and 43 respectively, and for the low group 32, 41 and 34. Evidence of heritable varietal differences in natural crossing was obtained, suggesting the possibility of breeding lines with a high rate of crossing, for use in the production of F_1 hybrid seed.

2628 WAHHAB, A. & MUHAMMAD, F.
Oil determination in cottonseed.
Pakist. J. sci. Res. 1956 : **8** : 44–45.

Details are given of a rapid and simple method developed for estimating oil content for the purpose of cotton selection in West Pakistan. The method involves filtration of 5 g. samples treated with petroleum ether.

2629 GREEN, J. M.
Frego bract, a genetic marker in upland cotton.
J. Hered. 1955 : **46** : p. 232.

The development of the abnormally long and narrow involucral bracts borne by a mutant designated frego appears to be determined by a single recessive gene.

2630 SANTHANAM, V.
Studies on the inheritance of some anthocyanin and corolla colour characters in Asiatic cotton.
Madras. agric. J. 1956 : **43** : 13–30.

In crosses of *Gossypium arboreum* race *indicum* with varieties of three other races, the gene R_2^{OS} for green stem and petals with a ghost spot was recessive to R_2^{AS} for sun-red stem and spotted petals and to R_2^{RS} for full-red stem and spotted petals. Pale yellow (Y_a^P) and white (y_a) corolla colour were recessive to yellow (Y_a). The Y_a and R_2 loci were independently inherited, but interaction occurred between R_2^{RS} and the alleles Y_a and y_a.

2631 NANJUNDAYYA, C.
The highest standard warp count—an explanatory note on.
Technol. Bull. Indian cent. Cott. Comm. 1955 : Ser. A. : No. 88 : Pp. 8.

Methods of testing cottons for spinning quality are discussed and the advantages of the method used at the Matunga Technological Laboratory, Bombay, involving the determination of the highest standard warp count, are described.

2632 Evenson, J. P.
Botanical studies in cotton quality. I. Morphological factors affecting proneness to nep. II. A simple airflow method for measuring cotton fineness and maturity. III. A modified sorter technique.
Emp. Cott. Gr. Rev. 1955 : **32** : 157–67, 251–55; 1956 : **33** : 12–15.

In part I the causes of the tangled and seed-coat types of nep are discussed. Seed-coat nep arises from weakness of the chalazal cap. As a means of determining proneness to this type of nep, determination of the percentage of seeds showing removal of the chalazal cap in ginning is proving useful in breeding at the Namulonge Cotton Research Station, Uganda. Because of its lower maturity, the chalazal lint may be a major source of tangled nep. Breeding should therefore aim at minimizing the difference in maturity between the chalazal lint and the lint of the rest of the seed. This difference may be estimated by the technique described in part II. The use and limitations of a modification of the standard sorter test in selecting for yarn strength are described in part III.

2633 De, B.
Possibilities of introducing long and medium staple cottons in Assam.
Indian Cott. Gr. Rev. 1955 : **9** : 93–105.

Soil and climatic conditions in Assam are compared with those of other cotton-growing areas in India, to assess the possibilities of cultivating medium and long staple varieties, in addition to the indigenous short staple types. Reasons are given for regarding the cultivation of annual and perennial longer staple types as a feasibility, in spite of the high rainfall, and it is suggested that suitable varieties could be obtained by introduction, selection of indigenous and introduced stocks and hybridization.

2634 Baxa, F.
Pestovanie bavlny v ČSR—II. časť. (**Cotton growing in Czechoslovakia. Part II**).
Pol'nohospodárstvo 1955 : **2** : 302–13.

Under the relatively low temperatures of Czechoslovakia, development of the plants is slow. It is thought that plants less affected by low temperature could be obtained by rearing hybrids under conditions of decreased temperature and lengthened day (cf. Abst. 1444).

2635 Méndez R., E. D. & Gamero de la Torre, O.
Nematodes y selecciones de algodón Tangüis. (**Nematodes and selections of Tangüis cotton**).
Inf. mens. Estac. exp. agríc. La Molina 1955 : **29** : No. 340 : 11–14. (Mimeographed).

Observations on a number of selections of Tangüis cotton in Peru showed only slight differences in their attack by *Heterodera marioni*, none of them being truly resistant. Line 2M1041–49 exceeded all others in yield of fibre.

2636 Fröier, K.
Svalöfs nya spånadslinsorter och deras praktiska betydelse. (**The new Svalöf fibre-flax varieties and their practical significance**).
Sverig. Utsädesfören. Tidskr. 1955 : **65** : 402–17.

An account is given of the distribution and acreages of flax varieties in Sweden since 1943 and the chief varieties are described. At present, the most widely grown variety is the Netherlands flax Wiera.

2637 Forsøg med sorter af spindhør 1953–1954. (**Trials of flax varieties, 1953-1954**).
Tidsskr. Planteavl 1955 : **59** : 721–22.

Brief information is given on the performance of one American and six European varieties tested at four stations in Denmark.

2638 Vezelvlas, 1956. (**Fibre flax, 1956**).
Landbouwvoorlichting 13 : Bijl. 2 : Ber. Rassenkeuze 1956 : No. 199 : unpaginated.

Data on yields of seed and fibre of eleven varieties tested on different types of soil in the Netherlands in 1955 are presented. Madonna, Diana and Wiera gave the highest yields of straw on all types of soil and Solido, Wiera and Regenboog [Rainbow] gave the highest yields of seed. Solido and Noblesse [Nobility] had the highest fibre contents.

2639 Wiersema, H. T.
Flax scorch.
Euphytica, Wageningen 1955 : **4** : 197–205.

Differences in virulence but not in specificity were found among different isolates of *Pythium megalacanthum* tested on four flax varieties at the Wageningen Foundation for Agricultural Plant Breeding, Netherlands. The method used for testing for resistance is described and the reactions of 37 varieties are noted. Resistance appears to be determined by more than two genes.

2640 FLOR, H. H.
Host-parasite interaction in flax rust—its genetics and other implications.
Phytopathology 1955 : **45** : 680–85.

The pathogenicity of 67 F_2 cultures from the cross race 6 x race 22 of *Melampsora lini* was tested on 32 flax varieties each carrying a single gene for rust reaction. Two varieties were resistant and six susceptible to all cultures. The 24 varieties on which the cultures segregated for pathogenicity fell into 12 differential groups, the segregation ratios on all but one of the varieties indicating that virulence in the pathogen was in each case determined by a single recessive gene; the ratio obtained on Ottawa 770B suggested that on this variety virulence was conditioned by two genes. Fifty-four pathogenic races were distinguished among the 67 cultures. In accordance with the view that each gene governing rust reaction in the host interacts with a specific gene for virulence in the pathogen (cf. *PBA*, XXV, Abst. 1256), 25 pairs of such interacting genes in flax and rust have been identified. The value of flax differentials carrying single genes for rust resistance in identifying rust genotypes and in breeding for rust resistance is discussed.

2641 FRÖIER, K.
Svalöfs samkönade Mona-hampa. (**The monecious Svalöf hemp Mona**).
Allmänna Svenska Utsädesaktiebolaget, Svalöf 1956 : 28–29.

Mona was selected by the Swedish Seed Association from the progeny of the spontaneous crossing of Schurig with an almost monecious form developed from the German varieties Neuer [New] and Sengbusch. It is taller, somewhat earlier and more even in growth than the German parental material, has greater resistance to *Botrytis cinerea* and gives higher seed yields. The proportion of male plants is about 0·01%.

2642 BÓCSA, I.
A kender heterózis-nemesítésének eredményei. (**Results of heterosis breeding in hemp**).
Növénytermelés 1954 : **3** : 301–16.

At the Kompolt Experimental Station, Hungary, hybridization between improved local varieties was without heterotic effect, but hybrids between a medium-late Chinese hemp and four Hungarian pollen parents showed marked heterosis in respect of stalk yield and fibre yield and formed denser stands than the parents. The most productive combination was Chinese x Kompolt F, with 23·4% more stalks and 18·2% more fibre than the latter parent and 21·3% more stalks and 31·4% more fibre than the former. The hybrids resembled the Chinese variety in external appearance and resistance to *Psylliodes attenuata* but were intermediate between the parents in earliness and proportion of fibre. Little cross fertilization occurred when a mixture of the parental varieties was grown, the most satisfactory method of large-scale hybridization being mass pollination of the emasculated parent.

2643 ŁĄCZYŃSKA-HULEWICZOWA, T.
Zjawisko polisomii w konopiach di- i tetraploidalnych. (**The phenomenon of polysomaty in diploid and tetraploid hemp**).
Acta Soc. Bot. Polon. 1955 : **24** : 733–48.

In root tips of both diploid and tetraploid plants of *Cannabis sativa* most of the periblem cells had twice the number of chromosomes of the other cells. Binucleate cells arising by mitosis unaccompanied by wall formation are also found in the periblem and it is thought that in such cells the nuclei may fuse completely and subsequently divide regularly to give rise to polyploid cells or may fuse incompletely and undergo abnormal division.

2644 HERICH, R.
Působení kyseliny 2,4-dichlorfenoxyoctové na diferenciaci pohlaví konopí (*Cannabis sativa* L.). [**The effect of 2,4-dichlorophenoxyacetic acid on the differentiation of sex in hemp (*Cannabis sativa* L.)**.
Biológia, Bratislava 1955 : **10** : 760–64.

Maceration of seeds in redistilled water raised the proportion of female individuals. A 0·016 concentration of 2,4-dichlorophenoxyacetic acid had the same effect, but a concentration of 0·020 acted conversely. Maceration in water or the acid reduced the number of monecious individuals.

2645 **Annual Report of the Indian Central Jute Committee for the year 1954-55** : Pp. 281.

Investigations at the Jute Agricultural Research Institute included the following on jute and *Hibiscus*:—

Jute. In trials at the institute, JRC–919 (*Corchorus capsularis*) outyielded the control by 20%. *C. olitorius* 'JRO–753', 'JRO–632' and 'JRO–620' gave 30, 25 and 18% higher yields than the control CG respectively. Variety trials were also carried out in several different states.

The three last-mentioned varieties gave considerably higher yields than the local varieties in trials on cultivators' plots in West Bengal.

Over 4000 secondary selections were made in progeny-row trials of *C. capsularis* and *C. olitorius*, including hybrid and X-irradiated material.

Study of the inheritance of the "full green" condition, a variant with serrate leaves and female sterility, crumpled leaf, leaf shape and size, plant height and earliness in *C. capsularis* continued. Inheritance of a light-red variant of *C. olitorius* with crumpled leaves is also under investigation.

In work on vegetative rapprochement as a means of overcoming interspecific incompatibility, no viable seed was obtained from crosses among *C. capsularis* and *C. olitorius* grafts.

Fully developed seeds were obtained from some interspecific combinations between diploids of the cultivated species and between wild and cultivated diploid types. No or only a few pods were set in interspecific crosses involving tetraploids of wild and cultivated types of *C. olitorius* and *C. capsularis* or these tetraploids and their diploid progenitors. Among the crosses attempted between wild species, fully developed seeds were only secured from *C. trilocularis* x wild *C. capsularis*.

Tetraploids of wild types of *C. capsularis* and *C. olitorius* were procured by colchicine treatment of the seeds. Meiotic irregularities in plants from a $2n$ x $4n$ population of *C. olitorius* are described.

Fragments were common at meiosis in X_1 plants of *C. olitorius*. Pollen of *C. olitorius* and *C. capsularis* was irradiated with 600–1500 r. but attempts to cross the two species by means of this pollen failed. Variations in morphology were studied in X-irradiated material obtained in previous years.

Varieties of *C. capsularis* have displayed resistance to *Nupserha bicolor* ssp. *postbrunnea*.

Numerous physiological investigations included response to vernalization and different photoperiods and salt resistance. As a result of vernalization, *C. capsularis* varieties flowered 15–18 days earlier and *C. olitorius* varieties 8 days later. Short photoperiods induced earlier flowering in both species whereas long photoperiods delayed flowering by approximately 7 days. In germination tests, seeds of *C. siliquosus*, *C. tridens* and *C. trilocularis* showed more salt resistance than those of cultivated jute.

Hibiscus. Selection of *H. cannabinus* and *H. sabdariffa* is in progress. Hybrids of *H. radiatus* x *H. cannabinus* and inheritance of anthocyanin pigmentation in *H. sabdariffa* and *H. cannabinus* are under investigation. The character pair palmate-lobed *vs.* partially lobed leaf in *H. sabdariffa* was again found to depend upon a single pair of genes (cf. *PBA*, XXV, Abst. 412). Inheritance of earliness of maturity in *H. cannabinus* is receiving attention. Seeds from *H. radiatus* x *H. cannabinus* were treated with colchicine; seeds were obtained from the C_1 plants.

2646 KAWADA, H.
(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent species. XIII. The relation between growth and soil reaction).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1955 : **6** : 121–29. [Japanese].

In continuation of his studies on *Hibiscus* (*Abelmoschus*) *esculentus*, *H. manihot* and the amphidiploid hybrid between them (cf. *PBA*, XXV, Absts. 2225–6), the author examined the effect of growing each on a series of artificial soils with pH ranging from 1·2 to 11·8. The amphidiploid was rather less injured by extreme acidity or alkalinity.

2647 KUWADA, H.
(On differences in physiological and ecological characters between amphidiploids obtained by breeding and the parent plants. XV. Growth after various sowing dates).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1955 : **6** : 292–97. [Japanese].

In continuation of this series of investigations (cf. Abst. 2646), the author studied germination rate, vegetative period and plant size in *Hibiscus* (*Abelmoschus*) *esculentus*, *H. manihot* and their amphidiploid derivative in sowings made at 10-day intervals from the end of March to the end of August. The period required for flowering was longest in the amphidiploid, which was, in general, taller and produced a greater weight of shoot and root than the parent species.

SUGAR AND STARCH PLANTS

Memoria de la XXVIII Conferencia Anual. Asociación de Técnicos Azucareros de Cuba. (**Report of the 28th Annual Conference of the Association of Sugar Technologists of Cuba**).
La Habana 1954 : Pp. 447.

2648 *Barreto, R. Estudios comparativos con nuevas variedades realizados por la Estación Experimental de la Caña de Azúcar de Jovellanos. (Comparative studies of new varieties carried out at the Jovellanos Sugar Cane Experimental Station). (pp. 9–19).*

Significant differences were observed between the yields of some of the new seedlings and those of the standard canes such as POJ2878 and Pepe Cuca.

2649 *García Baylleres, J. L. Origen y desarrollo de los organismos vivos. (Vegetales y animales). Efectos de las radiaciones. [Origin and development of living organisms (plants and animals). Effects of radiations]. (pp. 59–64).*

The production of sweet lupins in Germany, Marquis wheat in Canada, cold-resistant sugar canes in the USA, substitutes for the vine and a sugar-producing flax in Russia, X-ray mutants of barley in Sweden and *Spartina townsendii* as a rice substitute in England are cited as achievements of applied genetics. An analogy is drawn between the mutation of a gene under the influence of a photon of radiation and the formation of an isotope by bombardment of an atom.

2650 WANG, C.-C.
(Comparative studies on the initial and ratoon crops of sugar-cane varieties).
Chunghua Nunghsueh Hui Pao/J. agric. Ass. China 1955 : No. 10 : 30–68. [Chinese].

Extensive data are provided on the growth, cane yield and sugar concentration of the initial and ratoon crops and on disease resistance for a series of local and introduced varieties under trial in Taiwan. The best varieties were N : Co. 310 and F134.

2651 **Special sugarcane supplement.**
Indian Fmg. Pp. 1–68.

This popularly written supplement contains several articles dealing with the progress made in sugar-cane research and production in India. Two of the contributions deal with breeding. In an introductory article, At the birth-chamber of sugarcane-breeding in India, T. S. Venkatraman describes the achievements of early work at Coimbatore. In his account of the Sugarcane Institute at Coimbatore, N. L. Dutt deals mainly with the characteristics of the most important older and new Co. varieties.

2652 HEBERT, L. P. & ARCENEAUX, G.
Tests of sugarcane varietal milling qualities.
Sug. Bull., N. Orleans 1955 : **34** : 70–76.

Methods used at the Houma Station, La., to estimate comparative yields of sugar in plantation trials are explained.

2653 **55th Annual Report of the Bureau of Sugar Experiment Stations, Queensland 1955** : Pp. 95.

Numerous crosses and some selfings have been carried out by the Division of Plant Breeding. Among varieties used as parents were Tukuyu 2 (*Saccharum spontaneum*), J125, N:Co. 291, 292, 339 and 349, 51NG17 and US48/34. Five QB53 lines, the products of the first nobilization of 51NG140 (*S. robustum*), underwent further nobilization. I233, a variety adapted to rich soil and highly resistant to lodging, has been used in 16 crosses. Thick Badila, a thick-stemmed type, has outyielded other Badila varieties. A chromosome number of $2n = 80–82$ has been observed in the New Guinea *S. robustum* variety 51NG63.

Methods of protecting stands from foreign pollen are being studied.

2654 RAGHAVAN, T. S.
The bearing of certain recent cytogenetical findings on sugarcane breeding.
Proc. Indian Acad. Sci. 1956 : **43** : Sect. B : 100–09.

Cytological characteristics of sugar canes are surveyed, particular mention being made of (1) their generally complex hybrid constitution and high degree of heterozygosity, the latter resulting in wide variation in the hybrid progenies and the former in a considerable amount of interspecific and intergeneric fertility; (2) the frequent occurrence of various forms of parthenogenesis, particularly postmeiotic diploid parthenogenesis giving progeny of varied genetic constitution and parthenogenesis preceded by elimination of chromosomes; and (3) the occurrence of cytoplasmic inheritance of both quantitative and qualitative characters. The origin and genetical constitution of a number of recently developed commercial seedlings are indicated.

2655 KING, N. J.
Erect varieties for better profits.
Cane Gr. quart. Bull. 1956 : **19** : 83–84.

Attention is drawn to the capacity shown by the sugar cane Q57 to resist lodging in northern Queensland. The new lodging-resistant seedlings

I2222, I233 and K641 are mentioned; in addition to their erect habit they possess a high sugar content.

2656 Buzacott, J. H.
Progress in the development of varieties for rich land.
Cane Gr. quart. Bull. 1956 : **19** : 84–85.

Descriptions are given of four sugar-cane varieties now under test on rich land in Queensland: I233 (SJ4 x A275), K641 (Q10 x Q27), K658 (I209 x Badila) and K969, also from the last-mentioned cross.

2657 Hirshhorn, E.
Comportamiento sexual de *Ustilago scitaminea*. (**Sexual behaviour of *U. scitaminea***).
Rev. Invest. agríc. B. Aires 1955 : **9** : 317–23.

Single-spore inoculations showed some strains of the fungus to be homothallic and others to be heterothallic. These findings taken in conjunction with the morphological variability of the sugar-cane smuts in Argentina lead the author to suggest that they may have arisen by interspecific hybridization.

2658 **Observations on sugar cane diseases in Australia and Fiji.**
Bull. Mauritius Sug. Industr. Res. Inst. 1955 : No. 5 : Pp. 52.

The bulletin includes information on procedures used in testing the reactions of sugar-cane varieties to ratoon stunting, Fiji disease and leaf scald in Australia and Fiji.

2659 Arnon, I.
(**Irrigated sweet sorghum for fodder and silage**).
Sadeh (Field)/Hassadeh 1954 : **34** : 453–56. [Hebrew].

About 60 varieties of sweet sorghum are being tried in Israel as fodder and silage crops under irrigation. The relatively late-maturing varieties Honey, Honey x Leoti, Texas Seeded Ribbon Cane and High hegari gave the best results, yielding 56–83 ton of green fodder per ha.

2660 Grüneberg, J.
Gegenwartsfragen der Zuckerrübenzüchtung. (**Current questions in the breeding of sugar beets**).
Vorträge der Herbsttagung Goslar der deutschen Landwirtschafts-Gesellschaft. (**Lectures held at the autumn session of the German Agricultural Society in Goslar**).
Arch. dtsch. LandwGes. 1955 : **16** : 80–97.

The author presents an account of recent progress in sugar-beet breeding in Germany and abroad, including the exploitation of heterosis and the value of male sterility in the production of F_1 hybrid seed, the development of polyploid forms by colchicine treatment, interspecific hybridization to confer resistance to drought, nematodes and *Cercospora beticola* and selection for resistance to yellows. Better keeping quality and improved resistance to *C. beticola* are stated to be the most important breeding aims in the immediate future.

2661 Archimowitsch, A.
Selective breeding of sugar-beets in Russia and the USSR.
Bot. Rev. 1956 : **22** : 1–37.

A survey of the background and organization of the sugar-beet industry in Imperial and Soviet Russia is followed by an account of breeding methods and objectives, genetical and cytological investigations and commercial varieties. The section on breeding deals with mass and individual selection, inbreeding, methods designed to eliminate the undesirable effects of related crosses, selection according to the criteria of morphological and histological characters and seedling vigour, selection for resistance to fungous diseases and for early maturity and drought resistance, field and laboratory techniques, vegetative propagation of breeding material, control of pollination and methods of reducing the time taken to produce a generation. The bibliography contains 88 references.

2662 Mazlumov, A. L.
(**Using I. V. Mičurin's methods in breeding sugar beet**).
Zemledelie (Agriculture) 1955 : No. 10 : 43–47. [Russian].

Mention is made of R023, R06, and R931, new varieties from the Ramonj breeding station. They have a short growth-period and combine high sugar and root yields, besides being tolerant of drought and free from bolting. All of them respond by increased yield to improved nutrient supply and wide spacing and are therefore suitable for cultivation in squares.

2663 Weitzman, L., Gutstein, I. & Halfon, A.
(**Experiments on sugar-beet varieties**).
Sadeh (Field)/Hassadeh 1954 : **34** : 384–88. [Hebrew].

Experiments to compare sugar-beet varieties were conducted during 1950–53 in the coastal plain of Israel. Zwaanesse III, Pedigree Original, Kleinwanzleben E, Desprez R, Desprez TM, Merveille, Pedigree 99/75, Pedigree 98/85 and US56/2, all E-type varieties, gave the highest yields of sugar per acre.

Sugar beet is usually grown in Israel as a winter crop (sown in September-October, harvested in May-July); therefore resistance to bolting is an important character. Highest resistance to bolting was shown by Zwaanesse III, Merveille, US56/2 and Kleinwanzleben E.

US226/225, US215/216/3 and US226/216, reported as *Cercospora*-resistant in the USA, were attacked as severely as the other varieties, but somewhat later, by this pathogen.

2664 WEITZMAN, L. & GUTSTEIN, I.
(**Testing sugar beet varieties at four sowing times in the coastal region**).
Sadeh (Field)/Hassadeh 1955 : **35** : 412–14, 512–13. [Hebrew].

Fourteen varieties of sugar beet were compared at four sowing times (November, December, January and March) in Israel. The highest yield of sugar was given by Zwaanesse III, Pedigree 98/85 and Kuhn R.

2665 MARGARA, J. & OMETZ, S.
Les hybridations interspécifiques chez la betterave. Étude cytologique et morphologique d'un hybride entre betterave sucrière et *B. lomatogona* F. et M. (**Interspecific hybridizations of beet. Cytological and morphological study of a hybrid between sugar beet and *B. lomatogona* F. et M.**).
Ann. Inst. nat. Rech. agron., Paris 1955 : Sér. B : **5** : 445–62.

The three sections of the genus *Beta* are discussed with reference to problems encountered in effecting interspecific crosses. The F_1 of a cross carried out at the Central Station of Genetics and Plant Breeding, Versailles, between a tetraploid sugar beet with $2n = 36$ and a tetraploid form of *B. lomatogona*, also with $2n = 36$, were morphologically similar to the wild parent in the juvenile stage but bore a closer resemblance to the sugar beet parent at the end of the vegetative cycle. The character "hard fruit" of the wild parent proved dominant but the monogerm character was recessive. Meiosis was fairly regular in most plants; few quadrivalents were formed. One plant had a large number of univalents, another a large number of trivalents. Three of the seven hybrids were asynaptic, with $2n = 37$. Numerous chromatin bridges were observed at anaphase I and II in the majority of plants. All hybrids displayed a high degree of sterility. The suggestion is put forward that *B. lomatogona* may be an autotetraploid.

2666 MÁRTON, G., BABAY, G. & FRENYÓ, V.
Cukorrépa-csíranövények vízvesztése. (**Loss of water in sugar beet seedlings**).
Agrártud. Egy. agron. Kar Kiad. 1954 : **1** : No. 5 : Pp. 8.

Four sugar beet varieties resembled each other in behaviour on being deprived of water, but the variety C–242–53 Kommers regained the turgid state four times as quickly as Dobrovice when water was again supplied.

2667 MANCINI, E.
Selezione e conservazione di varietà resistenti alla fioritura nella bietola zuccherina. (**Selection and preservation of sugar-beet varieties resistant to flowering**).
Sementi elette 1956 : **2** : No. **3** : 2–7.

The practice of autumn sowing of sugar beet in southern Italy tends to encourage bolting and accentuates the need for nonbolting varieties. The Italian variety Cesena NSA has proved the best in this respect, followed by Klein AA and US56/2. The method of selecting for bolting resistance and capacity to germinate at low temperature adopted by R. T. Johnson (cf. Abst. 555) is described and Italian breeders are urged to give the maximum attention to breeding nonbolting strains for the south.

2668 NEGOVSKI [NEGOVSKIĬ], N. A.
Dezvoltarea stadială şi obţinerea soiurilor fără tije florale de sfeclă de zahăr cu mare productivitate. (**Phasic development and the production of nonbolting sugar beets with high productivity**).
An. Romîno-Soviet. 1955 : Ser. Agric. : **9** : 83–102.

The Russian article of which this paper is a Rumanian version was summarized in *PBA*, XXV, Abst. 435.

2669 KOVÁCS, A. & SZ. HOLLY, É.
Cukorrépafajták cercosporaellenállóságának okai. I. A fajta hatása a spóra csírázására. (**The causes of *Cercospora* resistance in sugar-beet varieties. I. The influence of the variety on spore germination**).
Növénytermelés 1954 : **3** : 333–50.

In studies carried out at Sopronhorpács, Hungary, germination of the conidia and growth of the promycelium of *C. beticola* were slower in dew, rain or distilled water which had been in contact with leaves of resistant beets than in water from leaves of susceptible varieties, and were most rapid in pure distilled water. Conidia of *Alternaria tenuis* similarly germinated more rapidly in dew collected from susceptible varieties than in that from resistant material.

2670 SEVOSTJJANOV, S. P. & ELECKAJA, L. E.
(Breeding sugar beet for resistance to *Cercospora* and high sugar).
Agrobiologija (Agrobiology) 1955 : No. 6 : 53–60. [Russian].

At the Pervomaĭsk breeding station, Krasnodar territory, new varieties of sugar beet characterized by resistance to *Cercospora* and a high sugar content have been selected. In the 1954 trials, PO28, the best among the new forms, produced more sugar per ha. than all normal and tonnage varieties tested and in sugar content was inferior only to the sugar type Janaš. It also produced larger amounts of leaves than the other varieties. The new forms have been crossed with R632, B541 and I 1747, varieties characterized by a high yield and short growth period from Ramonj, Biĭsk and Ivanovka respectively. Hybrids from direct crosses combined a high degree of resistance to *Cercospora* and improved sugar content with an increased root yield. The reciprocal hybrids showed good resistance to the disease at early stages of infection, gave root yields as high as those of the higher yielding parent and exceeded it in sugar content and yield per ha.

2671 SEDLMAYR, K.
A fajtaelőállítás Micsurini módszerei és újabb hazai eredményei. **(Recent results from applying Mičurinist methods of producing varieties in our country).**
Magyar tud. Akad. Biol. agrártud. Oszt. agrártud. Aloszt. Közl. 1952 : **3** : 227–42.

Recent work on hybridizing sugar beet in Hungary is described. The variety C53, obtained by hybridization, is resistant to *Cercospora*. A fertile hybrid has been obtained from the cross *Beta trigyna* x (*Beta maritima* x *B. vulgaris*). Experiments on vegetative hybridization between sugar beet and mangel have also been made.

2672 MARGARA, J. & TOUVIN, H.
Sur les possibilités d'obtention de types de betterave tolérants au virus de la jaunisse. **(On the possibilities of obtaining beet types tolerant of virus yellows).**
CR Acad. Agric. Fr. 1955 : **41** : 650–53.

At the Central Station of Genetics and Plant Breeding, Versailles, a number of hybrids obtained by crossing a sugar-beet variety with *Beta maritima* proved relatively tolerant of yellows. Repeated back crossing to the cultivated variety failed, however, to remove completely some of the more undesirable characteristics, such as low sugar content and forked roots, of the wild species. In trials, the French hybrids showed a greater degree of tolerance than tolerant lines and hybrids from the USA, the latter proving susceptible to some physiological races of the virus found in France.

STIMULANTS

2673 VICKERY, L. S.
Brief report of the International Scientific Tobacco Congress.
Lighter 1955 : **25** : No. 4 : 11–14.

A short account is given of the proceedings of the first International Scientific Tobacco Congress, held in Paris, 6–15 September 1955, to discuss genetics and selection, physiology, biochemistry, pathology and parasitology.

2674 OKA, M., TOKITSU, T. & MURAOKA, Y.
(Inheritance of some characters in intervarietal crosses of tobacco).
Ikushugaku Zasshi/Jap. J. Breeding 1955 : **5** : 123–26. [Japanese].

The crosses studied were Nambu [Southern] x Bright Yellow and Oxford 26 x Bright Yellow; observations were made of the breadth/length ratio of the leaf, leaf number, flowering period and plant height in the P_1, P_2, F_1, F_2, B_1 and B_2 generations. Heritability values for all of the characters were high (0·40–0·89). A strong positive correlation was noted between flowering period and leaf number.

2675 PAZOURKOVÁ, Z.
Statnost a ranost u tabáku při křížení mezi odrůdami. **(Vigour and earliness of tobacco in crosses between varieties).**
Preslia 1952 : **24** : 221–34.

Kentucky x Tisský, Gendertheimer x Tisský and Kentucky x Gendertheimer were distinguished by heterosis for yield at Prague and their use for production of hybrid seed is recommended. Together with other hybrids, they were characterized by great vigour and resistance to tobacco mosaic virus. Improved earliness was characteristic only of some hybrids and the possible causes for this are sought in unfavourable external conditions at vernalization. Alternatively, it is suggested that earliness in tobaccos may not be determined merely by the shortness of the vernalization and light phases.

2676 TERNOVSKIĬ, M. F.
(Using the theory of I. V. Mičurin in tobacco breeding).
Tabak (Tobacco) 1955 : No. 4 : 43–48. [Russian].

Breeding work at the Tobacco Institute, together with the Mičurinist techniques employed, is discussed. Achievements include the following new varieties characterized by combined resistance to mildew and tobacco mosaic virus. Trebizond 161, Dubec 7, Dubec 566 and Samsun 47/10 have been obtained by interspecific hybridization involving *Nicotiana glutinosa* which imparted resistance to its progeny. Immunnyĭ 2999 [Immune 2999] and Ostrolist Immunnyĭ 3000 [Immune Pointed-Leaf 3000] were produced by vegetative hybridization. Crosses of *N. rustica* x *N. glauca* and of *N. tabacum* x *N. alata* have been made; vegetative rapprochement and pollen mixtures were used. The hybrids so obtained are said to have practical value.

2677 TAKENAKA, Y.
(Cytological studies on *Nicotiana* plants. VIII. Meiosis in F_1 hybrids between *N. sanderae* and 3 other species).
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 236–41. [Japanese].

The plants studied were F_1 hybrids between *N. longiflora*, *N. plumbaginifolia* and *N. suaveolens*, acting as mother plants, and *N. sanderae*, acting as pollinator. In the first cross, the most frequent numbers of univalents at metaphase were 0–4, the mode being 1. In the second cross, the corresponding range was 0–3, the mode being 0. There appears to be some homology between the *N. sanderae* genome and those of *N. longiflora* and *N. plumbaginifolia*. In *N. suaveolens* x *N. sanderae*, the most frequent meiotic configurations were $3_{II} + 19_{I}$, $4_{II} + 17_{I}$ and $2_{II} + 21_{I}$, in that order.

2678 IZARD, C. & HITIER, H.
Observations sur un hybride complexe, susceptible de produire des plantes à stérilité mâle. **(Observations on a complex hybrid capable of producing male-sterile plants).**
Ann. Inst. exp. Tab. Bergerac 1955 : **2** : No. 2 : 93–105.

When the interspecific hybrid *Nicotiana suaveolens* ♀ x *N. tabacum* var. *chinensis* ♂ was treated with acenaphthene and the resulting amphidiploid progeny pollinated with pollen of *N. tabacum* var. Paraguay some male-sterile plants were found in the F_1. By back crossing fully fertile plants of the above cross to *N. tabacum* var. Paraguay a considerably higher percentage of male-sterile plants was obtained than in the first back cross of the original amphidiploid interspecific hybrid to *N. tabacum*. It is postulated that the male sterility is due to incompatibility between the cytoplasm of *N. suaveolens* and the chromosomes of *N. tabacum* and that this incompatibility increases with the number of back crosses to *N. tabacum* when this species is used as the ♂ parent. Crosses and back crosses carried out using *N. tabacum* as the ♀ and *N. suaveolens* as the ♂ parent did not result in male sterility. The possible value of male sterility in the production of commercial hybrid seed is pointed out.

2679 RENIER, A. & MOUNAT, A.
Étude comparative de variétés de tabac Paraguay de diverses origines. **(Comparative study of varieties of Paraguay tobacco of different origin).**
Ann. Inst. exp. Tab. Bergerac 1955 : **2** : No. 2 : 71–84.

Tabulated data are presented giving the results of trials of four provenance types studied at the Bergerac Institute, France, in 1950–52. Material from Marmande and La Réole gave higher yields of cured tobacco than that from Cahors or Périgueux. In respect of quality, tobacco obtained from plants of Marmande and Périgueux provenance was superior. Information on morphological differences noted between the four provenance types and on differences in nicotine content, disease resistance and number of lateral shoots formed is included.

2680 AR-RUSHDI, A. H.
Inheritance in *Nicotiana tabacum*. XXVI. Sterility genes from Tomentosae species.
J. Genet. 1956 : **54** : 9–22.

Sesquidiploids from *N. tabacum* 4*n* x *N. setchellii* and *N. tabacum* 4*n* x *N. tomentosa* 'Acomayo' produced normal embryo sacs and good pollen but were completely seed sterile as the result of the failure of the pollen tubes to reach the ovary on account of their retarded growth. A single dominant gene Tr^1, in *N. setchellii* or *N. tomentosa*, when combined with the complementary gene Tr^2 in the *N. sylvestris* subgenome of *N. tabacum*, was responsible for this sterility. Tr^1 is situated on chromosome L. These results and the work of Greenleaf (cf. *PBA*, XI, Abst. 1053 and XII, Abst. 702) indicate the occurrence of two types with respect to genic sterility in sect. *Tomentosae*: one with a recessive gene as in *N. tomentosiformis* and some forms of *N. tomentosa* and the other with Tr^1, as represented by *N. setchellii* and other forms of *N. tomentosa*. It is suggested that *N. tabacum* arose as an amphidiploid involving *N. sylvestris* and a recombinant, derived from a cross between representatives of these two types and "free from both sterility genes".

2681 AR-RUSHDI, A. H.
The use of radioactive phosphorus in determining pollen-tube penetration in tobacco.
J. Genet. 1956 : **54** : 23–26.

"A procedure is outlined for the use of autoradiographs in determining the extent of pollen-tube penetration in the styles of tobacco flowers. The results were in close agreement with those obtained by direct observation. Radioactive pollen was obtained by transferring mature plants to nutrient culture containing radioactive phosphorus. At intervals after pollination styles were collected and exposed to X-ray film, the resulting autoradiographs showing the location of pollen-tube ends in relation to the length of the style. Normal flowers, in which fertilization occurs about 72 hr. after pollination, were compared with those in which genetically controlled sterility is effected by inhibition of pollen-tube development."

[Author's summary]

2682 SCHRÖTER, H.-B.
Untersuchungen über die Alkaloide des Gaterslebener Tabak-Sortimentes (Anbaujahr 1954). [**Investigations on the alkaloids of the Gatersleben tobacco collection (1954 season)**].
Kulturpflanze, Berlin 1955 : **3** : 114–26.

Three different alkaloids, nicotine, nornicotine and anabasine, were identified in the 17 species of *Nicotiana* analysed. Tabulated data are given showing the presence or absence of each of these substances in the different botanical and cultivated varieties examined and indicating which alkaloid predominated. These data include information on the nicotine and nornicotine contents of 102 varieties and experimental lines of *Nicotiana tabacum* and 42 varieties and lines of *N. rustica*. In the main the findings corroborated those of Šmuk and Borodzina (cf. *PBA*, XIII, Abst. 259) and Smith and Smith (cf. *PBA*, XII, Abst. 571). In the case of *N. nudicaulis*, *N. otophora*, *N. paniculata*, *N. sanderae*, *N. sylvestris* and *N. suaveolens*, however, the results of the writer's investigations differed from those of the above authors. Possible reasons for these discrepancies are suggested.

2683 KADAM, B. S. & RADHAKRISHNAMURTHY, B.
Inheritance of filament colour in tobacco.
Curr. Sci. 1955 : **24** : 419–20.

Crosses between a Turkish tobacco and the Indian variety Lanka indicated that the pink coloration of the tip of the filaments in the former was determined by two complementary genes, designated Fp_a and Fp_b.

2684 ENGLE, H. B.
Wildfire-mosaic free cigarleaf tobacco on trial.
Sci. Fmr., Pa. 1955 : **3** : No. 2 : 6–7.

Cigar-leaf tobacco lines resistant to wildfire and mosaic are being tested for quality at Lancaster, Pa.

2685 **Better flue-cured tobacco.**
Agric. Res., Wash. 1956 : **4** : No. **8** : p. 16.

Developed jointly by the US Department of Agriculture and the North Carolina Agricultural Experiment Station, Dixie Bright 244 is highly resistant to *Fusarium* and bacterial wilts and moderately resistant to black shank. In field tests over a six-year period it has outyielded the bacterial wilt and black-shank resistant flue-cured variety Dixie Bright 101 by 20%.

2686 CHAMBERLAIN, D. W.
Pathogenicity of *Pseudomonas tabaci* on soybeans and tobacco.
Phytopathology 1956 : **46** : 51–52.

When six isolates of *Ps. tabaci* from tobacco and six from soya bean were tested on both hosts, their pathogenicity was generally greater on the original host species, isolates from tobacco showing greater differences in virulence on the two hosts than those from soya bean.

2687 WOLF, F. A.
Production of Turkish or Oriental tobaccos having tolerance to black shank.
Agron. J. 1956 : **48** : 40–41.

Selections tolerant of black shank have been obtained from crosses of the Samsoun, Smyrna and Cavalla types with tolerant flue-cured varieties at the Department of Botany, Duke University, Durham, NC. The selections closely resemble their oriental parents in morphology. Tolerance depends upon multiple genes.

2688 WHITE, F. H.
Breeding and testing black rootrot resistant cigar tobacco strains.
Lighter 1955 : **25** : No. 4 : 14–18.

An account is given of the development of strains resistant to black root rot by crossing the susceptible varieties Connecticut Havana 38, Pennsylvania Broadleaf, Comstock Spanish and Connecticut Broadleaf with Resistant Havana 211, followed by back crossing, at the Tobacco Division, Ottawa, Canada. In tests during 1951–54, four of the strains, 705, 716, 722 and 725, were markedly superior to the susceptible parental varieties with respect to crop index (yield x grade index).

2689 ALCARAZ MIRA, E.
La resistencia al mosaico ordinario (*Marmor tabacci* var. *deformans*) (Holmes) de las variedades de tabaco. [**The resistance of tobacco varieties to common mosaic (*Marmor tabaci* var. *deformans* Holmes)**].
Bol. Inst. Invest. agron., Madr. 1955 : **15** : 439–54.

After inoculation of plants growing in the greenhouse and in the field with the Spanish strain of *Nicotiana* virus 1, a number of lines bred from Ambalema at the Instituto de Biología del Tabaco [Institute of Tobacco Biology] in Spain displayed resistance, though a certain proportion of the plants usually became infected in the field; the various degrees of infection are illustrated. Bolsunov's Precox, the Java Isère x Cabot hybrid from Bergerac and the author's Hybrid 20 were partially resistant. Several introduced hybrids derived from *N. glutinosa* were resistant, though their reaction varied in different seasons.

2690 VAN DER KNAAP, W. P.
Gegevens van veredeld theeplantmateriaal. (**Data on pedigree tea planting material**).
Bergcultures 1956 : **25** : 35–37.

The results of clonal trials at the Pasir Saronggé Tea Experimental Station are presented. The 15 clones recommended as being suitable for cultivation in Java and Sumatra are described in detail and information on degree of resistance to *Exobasidium vexans* is given. PS1 and PS354 gave the highest yields of all the recommended clones; PS1, KP3 and SA40 proved highly resistant to *E. vexans*.

2691 Aanbevolen thee plantmateriaal. (**Recommended tea planting material**).
Bergcultures 1956 : **25** : p. 45.

Fifteen clones recommended for cultivation in Indonesia by the Bogor Central Experimental Station are listed (cf. Abst. 2690). Information on resistance to *Exobasidium vexans* and on the proportion of cuttings of each clone that strike root is included.

2692 VAN DER KNAAP, W. P.
Results of tea clone experiments at Pasir Saronggé.
Arch. Theecult. 1955 : **19** : 47–98.

Information, including data on yielding capacity and resistance to *Exobasidium vexans*, is presented on 15 clones recommended for cultivation in Java on the basis of trials carried out at Pasir Saronggé during 1949–54. An additional 53 clones have been selected for further trials.

2693 Aanbevolen robustaplantmateriaal. (**Recommended Robusta planting material**).
Bergcultures 1956 : **25** : 57–59.

Clones and seedling families recommended by the Central Association of Experimental Stations, Bogor, Java, for large-scale and small-scale planting in Java and Sumatra, are listed. Clones BP39 and BP42 are stated to be suitable for large-scale cultivation on all plantations.

2694 **The seventh annual report of the Research Department of the Indian Coffee Board (1953-'54).**
Bull. No. 7 : Pp. 91.

At Balehonnur, Mysore, hybridization of *Coffea arabica* continued and further tests were carried out on clonal progenies of high-yielding selections of both *C. arabica* and *C. robusta*. Among the selections distributed to planters, S288, S333, S645, S795 and S434 have displayed a high degree of resistance to races I and II of *Hemileia vastatrix* attacking Coorg and Kent respectively.

2695 KRUG, C. A., CARVALHO, A. & ANTUNES FILHO, H.
Genética de *Coffea*. XVII—Herança do característico angustifólia em *Coffea arabica* L. (**Genetics of *Coffea*. XVII. Inheritance of the *angustifolia* characteristic in *C. arabica***).
Bragantia 1955 : **14** : 71–85.

Selfed progenies of two trees belonging to *C. arabica* var. *angustifolia* consisted almost exclusively of var. *angustifolia* and those from crosses with normal plants and with other botanical varieties were almost all normal, a 3 : 1 segregation being observed in the F_2 and a 1 : 1 in back crosses. In crosses with var. *murta*, one of the trees produced all normal plants, showing that it carried genes *TT* and the other gave *murta* and normal, indicating that it carried *tt*. When the two plants were intercrossed the F_1 consisted of normal plants, which on selfing gave 252 normal : 203 *angustifolia*, which is interpreted as a ratio of 9 : 7. The F_1 plants gave 1 : 1

ratios in back crosses with either of the two parents.

A number of other plants of var. *angustifolia* were studied; on selfing some of them produced only *angustifolia*, others gave normal and *angustifolia* in varying proportions, suggesting ratios of 1 : 1, 2 : 1, 9 : 7 or 13 : 3, and some gave only normal plants. In crosses with normals these other *angustifolia* plants produced normal progeny, with only one exception, and when crossed with the first two some of them were seen to carry the same genes and others different genes for the *angustifolia* condition. In some of these crosses the results of reciprocal crosses were different and later generations continued to segregate.

The symbols ag_1ag_1 and ag_2ag_2 are assigned to the two genes present in the first two *angustifolia* plants.

2696 KRUG, C. A., CARVALHO, A. & ANTUNES FILHO, H.
Genética de *Coffea*. XXI. Hereditariedade dos característicos de *Coffea arabica* L. var. *laurina* (Smeathman) DC. [**Genetics of *Coffea*. XXI. Inheritance of the characteristics of *C. arabica* L. var. *laurina* (Smeathman) DC**].
Bragantia 1954 : **13** : 247–55.

The variety described shows a close resemblance to var. *murta*, with which it has sometimes been confused. Its characteristics were transmitted to most of the progeny from open pollination and from selfing but in crosses with other botanical varieties all seedlings were normal and in crosses with normal plants the F_2 progeny segregated into 3 normal : 1 *laurina*. Certain normal plants also gave rise to some *laurina* plants on selfing, in the proportion of 3 normal : 1 *laurina*. Back crosses, F_3 progenies and crosses of *laurina* plants among themselves confirmed that the character is conditioned by a simple recessive gene. Crosses with vars. *murta* and *nana* showed var. *laurina* to contain the gene *tt* present in Bourbon.

Various attempts were made to cross var. *laurina* with other species but a seedling was obtained only in crosses with *C. canephora*; since it flowers profusely but bears few fruits, most of which are single-seeded, the seedling is probably a triploid.

In crosses with other botanical varieties the *laurina* character has been combined with *maragogipe* and *xanthocarpa*. The symbol *lrlr* is proposed for it and it is thought to have originated by mutation from Bourbon.

2697 VALLAEYS, G.
L'amélioration du caféier Robusta. (**Breeding Robusta coffee**).
Bull. INÉAC 1956 : **5** : 27–37.

Information is given on the selection of potential mother trees at Yangambi, Belgian Congo, during 1947–54. Yield increases of up to 30% have been obtained in the current selection programme.

2698 CARVALHO, A. & ANTUNES FILHO, H.
Melhoramento do cafeeiro. X—Seleção visando eliminar o defeito "lojas vazias do fruto" no café Mundo Novo. (**Improvement of coffee. X. Selection directed towards eliminating the defect "empty locules in the fruit" in Mundo Novo coffee**).
Bragantia 1955 : **14** : 51–62.

The defect referred to in an earlier publication (cf. *PBA*, XXV, Abst. 1305) occurred with different frequency in progenies of different selected plants of the Mundo Novo coffee examined in the years 1951–53. The progenies with a high incidence of the defect had a higher total yield of berries but a lower yield of high-grade coffee. Some progenies were entirely free from the defect and F_1 generations from defective x normal plants contained both normal and defective trees. The normal trees invariably gave rise to normal progeny. Seed produced by open pollination of such normal plants gave rise to trees with only about 7% of empty locules, as against 50% in the original Mundo Novo coffee, and seed from them is being distributed to planters.

Although some of the defective trees gave greater total yields than the normals this cannot, it is thought, compensate for the loss of quality and future breeding work with Mundo Novo coffee is to be concentrated entirely on the normal trees.

2699 Aanbevolen cacao plantmateriaal 1955/1956. (**Recommended cacao planting material 1955-56**).
Bergcultures 1956 : **25** : p. 34.

The Central Experimental Station, Bogor, Java, recommends clones DR1, DR2 and DR38 and several legitimate and near legitimate families obtained from crosses between them as suitable for cultivation in Indonesia. Some illegitimate seedlings from DR1 have also given promising results; in general, illegitimate seedlings from DR1 grow more vigorously than those from DR2 and DR38.

2700 van der Knaap, W. P.
Productiegegevens van veredeld cacao plantmateriaal. (**Yield data on pedigree câcao planting material**).
Bergcultures 1956 : **25** : 27–33.

Brief descriptions are given of clones DR1, DR2 and DR38, which yield 1000 kg. of cocoa per ha. in Java. The Trinidad clones ICS1 and ICS95 have also given good results in trials carried out by the Bogor Experimental Station.

Report of the Cocoa Conference held at Grosvenor House, London, W.1, 13th to 15th September, 1955 : Pp. 149.

The following contributions deal with cacao selection and hybridization:—

2701 *Cope, F. W. & Jolly, A. L. West Indian clones.* (*pp. 58–66*).

Data obtained on the performance of clones of selected mother trees in Trinidad and Grenada are surveyed, and the significance of soil and other environmental factors and of genetically determined differences with respect to precocity of initial fruiting and duration of economic productivity is discussed. The ICS series of clones in Trinidad lack the characteristic flavour of unselected Trinidad cacao, because, it is suggested, these clones represent only a portion of the variability of the local population. Although some clones have exhibited promise with respect to yielding capacity in trials in Trinidad and Grenada, a much greater number of selections, combined with more extensive facilities for testing, is needed for the development of clones satisfying all requirements of adaptability and flavour.

2702 *Rogers, H. H. New varieties of cocoa in west Africa.* (*pp. 76–79*).

F_3 pods or seedlings obtained by open pollination of 10 Upper Amazonian types belonging to series T are being distributed to farmers in West Africa. Originally introduced from Trinidad, the types involve in their parentages selections of Parinari, Nanay and Iquitos. They have considerably outyielded local Amelonado at the West African Cacao Research Institute, Tafo, Gold Coast.

Initial results suggest that improved varieties may be developed by controlled hybridization, characters such as large beans and compact habit of growth being transferable. A single-pod fermentation technique, based on that of Wadsworth and Howat, has been recently studied at Tafo and should prove valuable in breeding.

Promising clones of local and introduced types are being tested; although the system of farming in West Africa does not at present lend itself to use of vegetatively propagated material, it is expected that the growing of such material will be possible in the not too distant future.

A time-saving plan for the multiplication of varieties in clonal seed gardens is outlined.

2703 *Hammond, P. S. Field experience in the Gold Coast with Upper Amazonian and other new varieties.* (*pp. 79–83*).

The work of multiplication and testing undertaken by the Department of Agriculture, Gold Coast, in cooperation with the West African Cacao Research Institute, is described. Information is given on the performance of the recently released T types, as observed in plots established to provide F_3 material for distribution to farmers (cf. Abst. 2702). Production of rooted cuttings at 20 propagation centres is planned, primarily to provide material for planting seed gardens of selected clones. In variety trials to be established in 1956, derivatives of controlled pollinations of "Amazonian or Amazonian x hybrid or Amazonian x Amelonado" are to be tested.

2704 *Fennah, R. G. Some recent concepts in cocoa research and their relation to a programme of basic research.* (*pp. 107–13*).

The following were the chief topics discussed, with reference to research at the Imperial College of Tropical Agriculture, Trinidad: (1) effects of the root environment upon clonal growth and yield and (2) the required search for new genetic material in the local cacao of Trinidad and the concomitant problem of depletion of the natural reserve of genetic diversity as the result of rehabilitation of the estates.

2705 *Pickles, A. The research policy and programme of the West African Cocoa Research Institute.* (*pp. 117–21*).

This survey of research at the above institute mentions breeding.

2706 *Oechsli, L. P. & Boynton, D. The American Cocoa Research Institute and the Inter-American Cacao Center.* (*pp. 124–30*).

The outline given of projects at the Inter-American Cacao Center, Costa Rica, includes a short account of (1) tests of clones and their seedlings and (2) methods of evaluating clones for resistance to pod rot (*Phytophthora palmivora*). It is mentioned that collection of Central American material has been initiated.

2707 *Wadsworth, R. V. The preparation of cocoa.* (*pp. 131–37*).

The author describes an individual-bean method of testing chocolate flavour, developed by

Cadbury Bros., England. Chocolate, liquorice and other flavours may all be produced by aseptic methods from the same material by variation of the time/temperature treatment of the living bean. The repercussions the microfermentation technique is likely to have upon breeding and genetical work are discussed.

A report on cacao research, 1954.
Imp. Coll. Trop. Agric., Trin. 1955 : Pp. 81.

2708 *Cope, F. W. & Bartley, B. G. Some aspects of the plant improvement programme. (pp. 27–31).*

Breeding in progress in Trinidad is reviewed. Selection for early bearing is being carried out and clones are being tested for performance under various environmental conditions. The degree of self compatibility may be determined by an examination of the ovules of a single self-pollinated flower: full self compatibility results in 100% fusion between male and female gametes while self incompatibility has given the ratios 1 : 3, 1 : 1, 3 : 1 and, possibly, 15 : 1 of fusion to nonfusion. The genetics of incompatibility is under investigation. Resistance to *Marasmius perniciosus* has been found in progenies of introductions from the Amazon basin and is being incorporated into commercially acceptable Trinidad selections. Various degrees of susceptibility to *Phytophthora* pod rot have been observed in the Trinidad population but no resistant material has been obtained yet. Testing for flavour is carried out on promising selections, but so far nothing is known of the inheritance of flavour and quality.

2709 *Holliday, P. A test for resistance to* Marasmius perniciosus *Stahel. (pp. 50–55).*

An account is given of a technique involving inoculation of the germinating seedlings and the four classes of resistance recognized by means of the test are described. Resistance appears to depend upon hypersensitivity in the host plant.

2710 *de Witt, K. W. The flavour assessment of cacao. (pp. 77–81).*

The operation of a panel of unprofessional tasters at the Imperial College of Tropical Agriculture, Trinidad, is described and its advantages and drawbacks discussed.

2711 Blauwmaanzaad, 1956. (**Opium poppy, 1956**).
Lanbouwvoorlichting 13 : Bijl. 1; Ber. Rassenkeuze 1956 : No. 198 : unpaginated.

Data on yield, quality of seed and morphological characteristics are presented for the four varieties most widely grown in the Netherlands. Eckendorfer II and Noordster [Northern Star] gave the highest yields but their seed was inferior in quality to that of Nobel [Noble] and Emmabloem [Emma flower].

2712 Kohoutová, Z.
Šlechtění máku s ohledem na olejnatost. (**Breeding the poppy for high oil**).
Preslia 1953 : **25** : 97–106.

Among the varieties tested at Prague, Chlumec invariably had the highest oil content and Dětenice, which is highly productive of oil in most districts, took the fourth place in 1950 and third in 1951. Hokešův and Zborovický produced good seed and oil yields in both years. Data showing the degree of heterosis in respect of oil content and yield of seed and oil per ha. for some direct and reciprocal hybrids are presented. The hybrid of Dětenice x Chlumec had the highest oil content and produced the most seed.

2713 Osvald, V., Blattný, C., Osvaldova, K., Brčak, J. & Vopatová, O.
O možnosti skupinového výsky dvoudomých rostlin, speciálně chmele, podle pohlaví. (**The possibility that diecious plants, especially hops, occur in sexual groups**).
Preslia 1954 : **26** : 27–32.

Numerical evidence, based on observations of some hybrid hops in nurseries at Prague-Dejvice and Žatec, suggests that the plants are grouped according to sex, some groups being ♂ and others ♀. This is attributed to environmental effects upon sex differentiation during ontogeny; the view that sex is determined at an embryonic stage is rejected.

MINOR CROP PLANTS

2714 Kormos, J.
Vizsgálatok a paprika sterilitásáról. (**Investigations on sterility in red pepper**).
Ann. Biol. Tihany 1954 : **22** : 235–52.

An ovule-sterile variant found in the F_3 generation of a cross between the varieties Cece and Longum nigrum showed normal pollen development but had atropous ovules which lacked an integument and failed to undergo meiosis or to form an embryo sac. The female sterility was monofactorially inherited. In aneuploids with 26 somatic chromosomes, embryo-sac development was generally incomplete as a result of meiotic irregularities. At early diakinesis of microsporogenesis in aneuploids, triploids and diploids, small bodies, described as accessory nucleoli, appeared near the ends of many chromosomes and remained scattered in the cytoplasm during the second division.

The F_1 of crosses between the tomato-shaped strain 159 and a number of small-fruited varieties showed wide variation in shoot development ranging from normal plants to those developing no further than the cotyledon stage; a higher proportion of abnormal plants occurred when 159 was used as seed parent than in the reciprocal cross. The abnormalities were heritable and reappeared in the F_2.

2715 KORMOS, J.
A carotinoida festékszínek öröklődéséről. (**The inheritance of carotenoid pigments**).
Ann. Biol. Tihany 1954 : **22** : 253–59.

All the F_1 progeny of a cross between red and yellow sweet peppers resembled the red parent in carotenoid composition, while the F_2 included both parental types.

2716 KUMAZAWA, S. & OHARA, T.
(**The classification of Japanese pungent red peppers**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1951 : **1** : 39–41. [Japanese].

A fuller account of this work was summarized in *PBA*, XXV, Abst. 3323.

2717 OLSSON, G.
Några aktuella problem i samband med oljeväxternas förädling. (**Some current problems in connexion with the breeding of oil plants**).
Sverig. Utsädesfören. Tidskr. 1955 : **65** : 323–32.

This is a full account of work reported in Abst. 116.

2718 MANNER, R.
Hammenhögs Vestalraps. (**The Hammenhög rape Vestal**).
Våren 1956. Hammenhögs, Otto J. Olson & Sons AB : 8–11.

Trials of this new Swedish autumn rape, which was formerly known as Hg 1030 and is, like the variety Plus, a selection from Regal (cf. *PBA*, XXV, Abst. 452), have shown that it gives considerably higher yields of seed than the standard varieties Regal, Matador and Margo. Its 1000-grain weight is also higher and it matures several days later. Its average oil content for 1951–55 was the same as that of Matador or Regal but its total yield of oil was greater.

2719 RAJAN, S. S.
The effectiveness of the mass pedigree system of selection in the improvement of seed setting in autotetraploids of *toria*.
Indian J. Genet. 1955 : **15** : 47–49.

Individual tetraploids were selected from large populations on the basis of reference to norms fixed for characters affecting yield, chiefly seed number per siliqua. The seeds of the selections were then mixed in equal quantities, each bulk being grown in isolation from other $4n$ populations and subjected to selection on the basis of higher norms. Such selection was initiated in the C_8 and repeated in succeeding generations (cf. *PBA*, Vol. XXIII, Abst. 2126). Seed fertility in the C_{10} and C_{11} showed significant increases in comparison with the unselected C_8. The data suggested that fertility could be still further improved over that of the C_{11} generation.

2720 OLSSON, G.
Vindpollinering hos korsblomstriga oljeväxter. (**Wind pollination in cruciferous oil plants**).
Sverig. Utsädesfören. Tidskr. 1955 : **65** : 418–22.

Wind-borne pollen of rape, turnip rape and white mustard was found at distances of up to 40 m. from fields of the respective species and cross pollination occurred between plants inside and outside cages excluding the larger pollen-carrying insects. It is concluded that wind is an important pollinating agent for these species.

2721 **Sees way open to castorbeans with higher content of oil.**
What's New Crops Soils 1955 : **8** : No. 2 : p. 25.

Work reported in Abst. 1055 is briefly described.

Tercera Reunión de Lino realizada en la Estación Experimental de Tezanos Pinto 26 y 27 de octubre de 1950. (**Third Flax Meeting held at the Tezanos Pinto Experimental Station on 26 and 27 October 1950**).
Pergamino 1950 : Pp. 228. (Mimeographed).

A number of the contributions to the meeting comprised reports on the behaviour of varieties of flax and linseed in different parts of the Argentine Republic and Uruguay.

Items of more particular interest to plant breeders are the following.

2722 *Kugler, W. F., Davreux, M. A. & Lemos, O. R. Principales características de variedades de lino tipo oleaginoso ingresadas en el año 1948, en la colección de la Estación Experimental de Pergamino. (Main characteristics of linseed varieties included in 1948 in the collection of the Pergamino Experimental Station). (pp. 7–10).*

In comparisons of a number of introduced varieties with standard Argentine varieties, only Minerva CI 1081 exceeded Guaraní in yield of oil and a hybrid CI1975 x Crystal 916 exceeded Charrúa MA in iodine number. Indian 1193–1 and EEP17045 from Minnesota had a 1000-seed weight of over 10 g. and are being used as parents in consequence.

2723 *Marciotte, C. V. Posibilidades de la siembra de verano para fines fitotécnicos. (Possibilities of summer sowing for purposes of plant breeding. (p. 11).*

By sowing linseed in the summer it has been possible to produce two generations a year and also effect selection for resistance to pasmo.

2724 *Rosbaco, A. M. de M. de. Mejoramiento de lino oleaginoso, estado actual de los trabajos en Tezanos Pinto. (Improvement of linseed, present state of the work at Tezanos Pinto). (pp. 13–15).*

Six selections from various hybrids exceeded Charrúa and Guaraní in yield, the best being H496–11 (Charrúa x 7233), which is being subjected to further selection as it is susceptible to rust. Some other selections are superior in resistance to pasmo, others to *Fusarium lini* and some to rust.

Of the many selections under observation the majority are derivatives of Charrúa MA, the next most successful parent being Guaraní.

2725 *Marciotte, C. V. & Kugler, W. F. Estado de los trabajos de mejoramiento del lino textil en la Estación Experimental de Pergamino. (State of the work on flax improvement at the Pergamino Experimental Station). (pp. 17–20).*

Several of the best Argentine varieties such as Calchaquí, Mapún and Achay have been crossed with rust-resistant parents such as 10678–3 and Bombay to introduce rust resistance; the hybrids are then back crossed to the high-quality parent and some of the resistant selections do not differ from the recurrent parent in anything but resistance.

2726 *Rosbaco, A. M. de M. de. Nueva variedad de lino oleaginoso obtenida por la Estación Experimental de Tezanos Pinto. (New variety of linseed obtained by the Tezanos Pinto Experimental Station). (pp. 21–23).*

H261–5F5/45–2–3, a line from a cross of MaxFb T 400 x Querandí MA5 made in 1940, has distinguished itself by greater seed yield than all the standard varieties and resistance to *Fusarium lini* and rust.

2727 *Kugler, W. F. & Davreux, M. A. Descripcion de nuevas variedades de lino. (Description of new varieties of flax). (pp. 25–30).*

Keys for the identification of the varieties of linen flax and linseed grown in Argentina are provided and the varieties Charrúa MA, Achay MA, Calchaquí MA, and Ranquel MA are described.

2728 *Fischer, G. T. Reciente experimentación linera en "La Estanzuela." (Recent experiments with flax at La Estanzuela). (pp. 157–67).*

In tests in Uruguay the Argentine varieties Charrúa MA and Guaraní MA proved the most resistant to *Fusarium lini*.

2729 CULBERTSON, J. O. & KOMMEDAHL, T.
The effect of seed coat color upon agronomic and chemical characters and seed injury in flax.
Agron. J. 1956 : **48** : 25–28.

Study of isogenic lines differing only in seed-coat colour and associated characters showed the yellow-seeded lines to be higher in weight per 1000 seeds, oil content, iodine number and amount of damaged seed but lower in test weight (lbs. per bushel) and yield of seed than brown-seeded lines.

2730 MOROZOV, V. K.
(Using Mičurinist principles for breeding a large-seeded variety of sunflower).
Zemledelie (Agriculture) 1955 : No. 11 : 104–08. [Russian].

Krupnoplodnyĭ Saratovskiĭ [Large-seeded Saratov] yields 3·4–5·4 c. more seed per ha. than the standards for the Saratov province. In the 1954 trials it also surpassed all other varieties in oil yield, but in the previous year Saratov 10 produced 13·00 kg. more oil per ha. Krupnoplodnyĭ Saratovskiĭ was obtained by restricted open pollination of forms previously selected for large seed, uniform growth period, high oil content and resistance to diseases among the vegetative hybrids Ždanov 800/F_1 (Saratovskiĭ Gryzovoĭ [Saratov Chewing] x Saratov R27), Saratov R27/F_1 (Saratovskiĭ Gryzovoĭ x Saratov R27) and Saratovskiĭ Gryzovoĭ/F_1 (Tehasskiĭ x VNIIMK 1646 [Oil Plants Institute 1646]).

2731 HEISER, C. B.
Variation and subspeciation in the common sunflower, *Helianthus annuus.*
Amer. Midl. Nat. 1954 : **51** : 287–305.

Variation of anther colour, ray number, disc diameter and achene size and length were studied in wild and cultivated forms in the central and eastern parts of the USA. Considerable variation was found to exist, especially in ray number and disc diameter. Plants from Texas were found to have the smallest achenes and those from eastern regions of the USA the largest. It is probable that the complicated variation pattern exhibited by *H. annuus* can be explained largely by its occurrence as a weed and the extensive hybridization that has taken place both within the species and with other annual sunflowers.

2732 MJAKUŠKO, JA. P.
(New facts on selective fertilization in the sunflower).
Agrobiologija (Agrobiology) 1955 : No. 6 : 89–93. [Russian].

Experiments on open pollination at Krasnodar are reported and selective fertilization is discussed. It was found that each strain gave different proportions of hybrids and selfings and that the same strain varied in this respect in different seasons. The 1000-seed weight, oil and seed yields of VNIIMK 1646 [Institute of Oil Plants 1646] were improved and husk reduced by open pollination with VNIIMK 8931, a low-husk variety high in oil. Effects of a contrary kind were observed in the same seed parent when it was open pollinated with one or more varieties with inferior economic characteristics. After two generations of open pollination VNIIMK 1646 changed into a valueless hybrid population.

2733 PUTT, E. D. & ROYAS, M., E.
Field studies on the inheritance of resistance to rust in the cultivated sunflower (*Helianthus annuus L.*).
Canad. J. agric. Sci. 1955 : **35** : 557–63.

The results of field studies on crosses between the rust-resistant line 953–102–1–1–22, selected from California Oilseed x Texas Wild Annual, and three lines with different degrees of susceptibility, indicated that resistance to *Puccinia helianthi* is a dominant monogenically determined character.

2734 ROJAS M., E. & SWANSON, A. F.
Hacia la creación de tipos de girasol resistentes a la roya. **(Towards the creation of types of sunflower resistant to rust).**
Bol. trimestr. Exp. agropec., Progr. Coop. Exp. Agropec., Lima 1955 : **4** : No. 1 : 2–7.

In cooperative experiments between the experimental stations of La Molina in Peru and Morden in Canada (cf. Absts. 1636–7), it has been shown that resistance to *Puccinia helianthi* in *Helianthus annuus* is a simple dominant. Marked heterosis has been observed in many of the crosses and it is hoped to produce hybrid seed which will give greater yields of seed and forage; this is made possible by the existence of partial sterility in some of the selections.

2735 **Third Annual Report of the West African Institute for Oil Palm Research 1954-55** : Pp. 152.

In Nigeria, the programme of mother-tree selection and pollination continued at Nkwele and Umudike, and was completed at the Aba and Ufuma stations, which are now to be closed down (cf. *PBA*, XXV, Abst. 1327). Progenies from selections at the two last-mentioned stations are to be studied at the Abak station. New progeny trials established at the main station near Benin, Nigeria, included *dura* x *dura*, *dura* x *tenera*, *dura* x *pisifera* and Deli x *pisifera* combinations.

Selection of seed trees at the main station has given promising experimental results.

Two types of *nigrescens* fruits have been distinguished, viz. *rubro-nigrescens* and *rutilo-nigrescens*. The inheritance of the two types and also *virescens* and *Poissoni* (mantled) fruits is to be studied. Inheritance of *idolatrica* leaf is receiving attention.

Deli palms again outyielded Nigerian palms. Analysis of bunch structure threw light on the characteristics responsible for the high average bunch weight, larger fruits and higher fruit: bunch ratio of the Deli type.

Investigations were carried out on the sex ratio, production of ♀ inflorescences, periodicity of bunch yielding and other aspects of growth and flowering.

The oil content of the mesocarp in single bunches may be determined for breeding purposes from 6 samples each weighing 25–30 g.

2736 HUNZIKER, J. H.
Morfología cromosómica de nueve especies argentinas del género *Ephedra*. (**Chromosome morphology of nine Argentine species of the genus *Ephedra***).
Rev. Invest. agríc. B. Aires 1955 : **9** : 201–09.

Details of chromosome number and morphology are presented for nine Argentine species (cf. *PBA*, XXIV, Abst. 1375). The number $n = 7$ was established in *E. multiflora*, *E. triandra*, *E. americana*, *E. rupestris*, *E. ochreata*, *E. frustillata* and *E. tweediana*. Both *E. breana* and *E. andina* have diploid forms with $n = 7$ and tetraploid with $n = 14$; the tetraploid of *S. andina* has six chromosomes with satellites and is thought to be probably an allopolyploid. In all nine species the chromosome set consists of 5 large and 2 small chromosomes. This disposition, which is characteristic of many of the Asiatic species too, is regarded as the primitive one and deviations from it, such as occur in *E. gerardiana* and *E. sinica*, are thought to have arisen by translocation.

2737 ČERVENKA, V. J. B.
Studie polyploidních forem druhu *Valeriana officinalis* L. v Čechách. (**A study of polyploid forms of *V. officinalis* L. in Bohemia**).
Preslia 1955 : **27** : 234–42.

The diploid or polyploid character of some wild forms found in Czechoslovakia has been determined by measurements of the stomata. The relations between polyploidy and ecology and polyploidy and pharmaceutic requirements are discussed.

2738 STEINEGGER, E.
Arzneipflanzen mit erhöhtem Wirkstoffgehalt durch Polyploidie-Züchtung? (**Medicinal plants with increased drug content through polyploidy breeding ?**)
Umschau 1955 : **55** : 104–06.

In work on Solanaceous plants, a higher alkaloid content has generally been found in both artificial and natural tetraploids than in diploid races or species. Intervarietal differences occurred among induced tetraploids. Grafted *Datura* plants with $4n$ shoots always had a higher alkaloid content than those with $2n$ shoots, independently of the chromosome number of the root tissues.

2739 **Taming the wild yam.**
Agric. Res., Wash. 1956 : **4** : No. 7 : 8–9.

Dioscorea spp. containing diosgenin, a substance used for the manufacture of cortisone, are being collected in Mexico and Central America, preparatory to breeding for higher contents. The search is also being made for additional specimens of the rare Mexican species *D. spiculiflora*, containing not only diosgenin but two new sapogenins, viz. gentrogenin and correllogenin.

2740 Aanbevolen Hevea-plantmateriaal 1955/1956. (**Recommended *Hevea* planting material, 1955-56**).
Bergcultures 1956 : **25** : 49–57.

These recommendations, issued by the Central Association of Experimental Stations (AVROS), Bogor, Java, give information on clones and seedling families recommended for planting in Indonesia (cf. Abst. 1647).

2741 BEERY, L. A. (JUN.)
Notes on some *Dothidella* resistant Hevea clones from Brazil.
Bergcultures 1956 : **25** : 46–47.

The results of studies of 25 clones introduced into Java from Brazil by reason of their resistance to *Dothidella ulei* are reported. Only one clone, F 25, gave moderately satisfactory yields. The other clones may be of value for top budding to provide susceptible high-yielding trees with a crown resistant to attacks by the fungus.

FRUITS AND NUTS

2742 GUDZENKO, A. A.
(**Establish orchards on virgin land**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 12 : 42–45. [Russian].

Varieties of apple, pear, cherry and plum which are regarded as the most adapted to the severe climatic conditions of northern Kazahstan are listed. The apples include G–98–6 (Aport x Uralec [Ural Dweller]) from Karaganda, with fruits weighing 35–40 g. They keep well and their flavour is good. The hardiest among the pears is Limonovka [Lemon] from Penza. It produces good quality fruits weighing 100 g. each. The stone fruits include recent selections from the Šortandy and Karaganda research stations, notably the winter-hardy large-fruited plum Dolinskaja Krasavica [Dolinskaja Beauty].

2743 GRANHALL, I.
Berättelse över verksamheten vid Balsgård år 1954. (**Report on work at Balsgård in the year 1954**).
Fören. Växtföräd. Frukttäd 1954 : 3–11.

Apple. Hybridization continued between American scab-resistant apples and Swedish varieties and further crosses involving Hans Mathiesen, Oretorpsrenett [Oretorp Reinette], Kunglig Kjortstjälk [Royal Short-stalk] and Old Nonpareil have been carried out (cf. *PBA*, XXV, Abst. 476). Cox's 41, a putative chimera in which the cell layer giving rise to the reproductive cells appears to be tetraploid, has been used to pollinate a number of diploid and tetraploid varieties. Studies of self fertility in tetraploids continued. Pollen from diploid and triploid trees has been treated with colchicine by the method described in *PBA*, XXV, Abst. 1367, in an attempt to induce chromosome doubling, the ultimate aim being the production of triploids and tetraploids by fertilization of diploids with treated pollen. Selections from James Grieve x Worcester 1 and Cox's Orange x Åkerö have shown promise. A tetraploid has been found among some open-pollinated Blenheim seedlings. Selection and testing of rootstocks were carried out. Fruit of the hybrid Golden Noble x Ontario has proved to be of good cooking quality and suitable for canning. The inheritance of vitamin C content is being studied.

Plum. Persikeplommon [Peach plum], Mount Royal, Early Laxton, Ruth Gerstetter, the Russian variety Otchakowskya, Jefferson and Späths Früheste [Späth's Earliest] have been used as parents in numerous crosses, the chief objective being the production of early hardy varieties of good quality. Tetraploid forms have been obtained from crosses between diploid and tetraploid varieties. Selections from Victoria x Reine Claude d'Oullins [Oullins Gage], Reine Claude Grön [Green Gage] x Victoria and Kirke [Church] x Bonne de Bry have shown promise. Year-old plants of Reine Claude Grön, Reine Claude d'Oullins and Bonne de Bry are being exposed to X and γ rays and fast and thermal neutrons in an attempt to induce useful mutations.

Cherry. Objectives include earliness, better quality, greater resistance to gummosis and tolerance of heavy precipitation during the ripening period. Trees remaining free from bacterial diseases under conditions of infection have been used in crosses. Bing, Noir de Guben [Guben Black], Stor Svart Bigarrå [Large Black Bigarreau] and Tradescant's Heart are being used as parents in the production of late-ripening bigarreau types. Vladimir 0–241 is being crossed with other sour cherries with the aim of obtaining hardy, early-ripening material. Diploid pollen induced by colchicine treatment during microsporogenesis is being used to pollinate tetraploid and diploid trees with the aim of obtaining new tetraploids. The new cherries Pr. 20756, Pr. 20774, Pr. 20875 and Pr. 20878, all developed from Allmän Gulröd Bigarrå [Common Orange Bigarreau], have shown promise, as have also Pr. 20635 from Fromms Herzkirsche [Fromm's Heart cherry] and Pr. 20894 of unknown origin, the last-mentioned being outstanding for its earliness, high fruit set and the excellent flavour of its fruits.

Strawberry. Varieties commonly grown in America have been crossed with those most frequently cultivated in Sweden.

2744 Studiedag van de NFO over de veredeling van fruitgewassen. (**NFO study day on fruit breeding**).
Fruitteelt 1956 : **46** : 186–87, 208–09.

H. G. Kronenberg, the first speaker at the above meeting, which was held at Wageningen on 31 January 1956, discussed immediate objectives in the breeding of varieties of soft fruit and gave brief descriptions of new varieties recently developed in the Netherlands or introduced from abroad. The new Dutch red currant Prominent gives high yields and the fruit shows good resistance to damage by rain. Of the black currants described, Daniël's September has one of the highest vitamin C contents. The gooseberry variety Goudbal [Golden Ball] is stated to give high yields of yellow, medium-sized berries of excellent quality (cf. Abst. 1773) and the German varieties Resistenta and Robustenta are of interest by reason of their high degree of resistance to *Sphaerotheca mors-uvae*. Jacobus, a new raspberry recently bred in the Netherlands, matures very late and is distinguished by its vigorous growth. Rode Radboud [Red Radboud] is a selection from Radboud, the variety most widely grown in the Netherlands. It has light red berries instead of the dark red berries of the parent variety. The American blackberry variety Thornless Evergreen (cf. Abst. 2814) is also described. The second speaker, J. Floor, discussed recent trials of new Malling rootstocks. A. S. de Bruyne spoke on new apple and pear varieties; the majority were introductions from England. C. J. Gerritsen gave a brief account of new walnut and peach varieties at present undergoing trials.

2745 MORETTINI, A.
Attività del Centro Miglioramento Piante da Frutto e da Orto annesso all'Istituto di Coltivazioni Arboree dell'Università di Firenze. Quinquennio 1950–1955. (**Activities of the Centre for Breeding Fruits and Vegetables attached to the Institute of Arboriculture of the University of Florence. Quinquennium 1950-55**).
Riv. Ortoflorofruttic. ital. 1956 : 3–37.

The development of the centre, which took the place of a substation for horticulture attached to the Istituto Tecnico [Technological Institute] of the university, is here traced from its inception in 1950. New hybrids of fruit trees and vegetables are tested at the centre and at a number of substations located in representative areas of Italy before being recommended to growers. Large collections of cultivars and hybrids of all the main fruit races maintained for observation are listed. Reference is made to two new varieties of peach (cf. *PBA*, XXIV, Abst. 1405) produced by the centre, for which patents have been applied for; to the Santa Maria pear (cf. Abst. 1716), which has been found very suitable for grafting on quince and for preserving in refrigerators, and to another seedling from the cross Coscia x Williams, ripening at the same time as Coscia but superior in size and form, due for release in 1956 under the name Butirra precoce Morettini [Morettini's Early Beurré]; to a new sour cherry named Amarena di Pescara [Pescara Morello] of high quality for conserving and for production of liqueurs; and to similar work in progress on the improvement of varieties of persimmon, quince and other fruits. A list is presented of the publications emanating from the centre since its foundation.

2746 Proefstation voor de fruitteelt in de volle grond Wilhelminadorp (Bij Goes). Jaarverslag 1954. [**Wilhelminadorp (near Goes) testing station for fruit cultivation in the open. Annual Report, 1954**]. Pp. 78.

The above station is concerned primarily with trials of apple, pear and plum rootstocks and with soil, mycological and entomological research.

2747 GORŠKOV, I. S.
(I. V. Mičurin and agricultural science).
Zemledelie (Agriculture) 1955 : No. 10 : 15–19. [Russian].

This account of breeding work at Mičurinsk on fruit trees, soft fruits, vine and hazel mentions wide crossing and forms which impart hardiness to their hybrid progenies. Fertile hybrids of *Malus* x *Pyrus*, *Sorbus* x *Pyrus*, *Prunus triflora* x peach, sweet cherry x sour cherry, currant x gooseberry, black currant x red currant and wild hazel x Caucasian hazels have been obtained.

2748 ENIKEEV, H.
(New varieties of fruit trees and soft fruits for the central Nonchernozem provinces).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 2 : 41–42. [Russian].

Plum. A number of winter-hardy productive varieties have been bred at the Moscow Horticultural Station. Most are crosses of the local variety Skorospelka Krasnaja [Early Red] with European varieties such as Victoria.

Cherry. High-yielding hardy varieties have been obtained by hybridization involving adapted local material.

Raspberry. Rozovaja [Pink], Russkaja [Russian] and Urožaĭnaja [Productive] have been produced by crossing local with English varieties. Urožaĭnaja yields up to 14 metric tons per ha. and the others are distinguished by high quality. All show resistance to chlorosis.

Black currant. Pobeda [Victory] and Sopernik [Rival], notable for hardiness, large fruit and productiveness, have been obtained by interspecific hybridization involving wild Siberian forms.

Gooseberry. Mention is made of high yielding varieties showing resistance to *Sphaerotheca*. They are all hybrids of Haughton or American varieties with European varieties.

2749 HOWES, F. N.
History and development of the cultivated fruits (part IX).
Rev. Ass. Agric., Lond. 1956 : No. 30 : 8–18.

Part IX of this series (cf. Abst. 1682) contains an account of the cultivation of the avocado, mango, pomegranate and cherimoya (*Annona cherimolia*). Information is given as to the countries in which these fruits are now grown, the extent to which their cultivation has spread from their former centres of origin and their importance to the European fruit market.

2750 KRAMER, S.
Entwicklungsetappen in der Obstzüchtung. (**Stages in the development of fruit breeding**).
Dtsch. Gartenbau 1955 : **2** : 289–90.

The author gives an historical account of fruit-tree breeding since the 18th century and distinguishes four consecutive stages in the development of breeding methods, the first being the selection of promising individuals from the progeny of open-pollinated élite trees, the second hybridization between trees superior in yield or in the quality of their fruit, the third the scientific study of the hereditary characteristics of trees of potential value for breeding purposes and the fourth Mičurin's system of directed training. Mičurin's successes in the development of new, hardy varieties are then outlined.

2751 Schander, H.
Keimungsphysiologische Studien an Kernobst. IV. Untersuchungen über Sortenunterschiede hinsichtlich der Temperaturansprüche und der Frostresistenz während der Keimung sowie über Alterungserscheinungen bei Samen von Kernobst). (**Studies on the physiology of germination in pome fruits. IV. Investigations of varietal differences in the temperature requirements and frost resistance during germination of seeds of pome fruits as well as of phenomena connected with aging**).
Z. Pflanzenz. 1955 : **35** : 179–98.

Two sets of experiments are described. In the first the effect of storage on seeds of Lange Winterbirne [Long winter-pear] was studied. It was found that the temperature required for optimum germination increased with the age of the seeds and, in the case of seeds that had been kept for five years, was occasionally as high as 10° C. The temperature requirements and frost resistance of the germinating seeds of 10 pear varieties used as stocks were ascertained in the second set of experiments, both well-established cultivated varieties and local Württemberg land races being included. In the case of fresh seeds, the optimum temperature required for germination varied according to variety and ranged from 2·5° to 4·5° C. Marked varietal differences were noted in the effect of high temperatures (10–20° C.) and low temperatures (± 0° C.) upon germination; older seeds proved less sensitive to high or low temperatures than fresh seeds. Varietal differences were also found in the effect of storing seeds for 1–5 years on the optimum temperature requirements for germination and stratification and in the degree of frost resistance shown by the seeds of a number of apple as well as pear varieties when they were stratified at —4° C. (cf. Absts. 1685–6).

2752 Visser, T.
Bloembiologische aspecten bij appel en peer. (**Floral biological aspects in apple and pear**).
Meded. Dir. Tuinb. 1955 : **18** : 933–44.

The results are cited of recent experiments at the Laboratory for the Cultivation of Horticultural Plants, Wageningen, Netherlands, on methods for studying insect attraction, incompatibility, parthenocarpy and sterility in apples and pears. Other topics mentioned include pollen germination *in vitro* and the importance of boron during pollen germination and pollen-tube growth (cf. Absts. 906 and 1687).

2753 Studiedag voor bewaren en afzet van fruit. (**Study meeting on the keeping and marketing of fruit**).
Fruitteelt 1956 : **46** : 84–85.

Data are included on the keeping properties of the principal varieties of apple and pear cultivated in the Netherlands.

2754 Murawski, H.
'Erwin Baur'—eine neue ertragreiche Apfelsorte. (**Erwin Baur, a new productive apple variety**).
Dtsch. Gartenbau 1955 : **2** : 279–80.

The above variety was selected at the Müncheberg Fruit Breeding Station, Eastern Germany, from a number of seedlings obtained by open pollination of Geheimrat Dr. Oldenburg [Privy Councillor Dr. Oldenburg]. It comes into bearing considerably earlier than its parent variety and outyielded Ontario, Roter Boskoop [Red Boskoop], Cox and Goldparmäne [Golden Pearmain] in recent trials. The fruit, which is medium-large to large and of an attractive appearance, has a thick, yellow, slightly rough skin with reddish streaks. The fruit is harvested at the end of September or the beginning of October and keeps until the following March. Erwin Baur has proved well adapted to soils of medium or poor fertility.

2755 Černík, V.
Zkušenosti s Mičurinovými mrazuvzdornými odrůdami. (**Experiments on winter-hardy Mičurin varieties**).
Za socialist. Zeměd. 1956 : **6** : No. 2 : 94–98.

A table showing the main economic characteristics of 17 Mičurin apple varieties, grown for a long period in Czechoslovakia, is presented.

2756 Tarasenko, M. T.
(**Mičurin apple varieties as initial material in breeding**).
Izv. Timirjazev. seljskohozjaĭstv. Akad. (News Timirjazev agric. Acad.) 1955 : No. 2 : 67–76. [Russian].

Timirjazevka, Puškino and Trofimovka, from the Timirjazev Horticultural Research Station, are distinguished by high yield, late ripening and large fruit with flesh of good flavour. Timirjazevka and Puškino are seedlings of the Mičurin variety Pepin Šafrannyĭ [Saffron Pippin]. They are hardy under Moscow conditions and Timirjazevka is also notable for scab resistance and late flowering whereby it escapes frost. Trofimovka, a seedling of Grime's Golden, is less hardy than the other two varieties.

2757 Johansson, E.
Två nya äpplesorter. (**Two new apple varieties**).
Sverig. pomol. Fören. Årsskr. 1955 : 5–10.

Full descriptions are given of two early ripening varieties bred at Alnarp, Sweden, both of which bear attractively coloured fruits of very good flavour. Snövit [Snow White], a very hardy selection from Stenbock [Ibex] x Pfirsichroter Sommerapfel [Peach-red Summer apple], has done well in north Sweden while Mio (Worcester Pearmain x Oranie) is suited to south and central districts.

2758 Nilsson, F. & Fernqvist, I.
Jättemutationer av äpple. (**Giant mutations of apple**).
Sverig. pomol. Fören. Årsskr. 1955 : 77–86.

Two bud mutations found on Wealthy and Charlamovsky, respectively, at the Gränna nursery, Sweden, both produced larger, flatter fruits and more rounded leaves than the parent varieties. The Wealthy sport had larger stomatal guard cells than Wealthy but normal pollen and well developed seeds, while the Charlamovsky mutant resembled its parent in guard cell size but had larger pollen grains and reduced pollen fertility.

2759 Dermen, H.
A homogeneous tetraploid shoot from a 2-2-4 type chimeral Winesap apple.
J. Hered. 1955 : **46** : p. 244.

By the method described in *PBA*, XIX, Abst. 1206, a sport in which all the tissues are tetraploid has been produced from a 2–2–4 cytochimeral Winesap tree at Beltsville, Md. The tetraploid is expected to be of value in breeding triploid varieties.

2760 **Big apple with a big future.**
Agric. Res., Wash. 1956 : **4** : No. 7 : 3–5.

A tetraploid form of Winesap has been secured by a disbudding technique developed by Dermen to encourage adventitious buds in chimeras. As previously reported, tetraploids of Delicious, Ontario, Wrixparent and McIntosh have also been obtained by this technique (cf. Absts. 1700–01).

2761 Murawski, H.
Untersuchungen zur Stadienentwicklung an Apfelsämlingen als Grundlage für die Obstzüchtung. (**Investigations on the developmental stages of apple seedlings as a basis for fruit breeding**).
Arch. Gartenb. 1955 : 3 : 255–73.

When buds of one to four-year old seedlings of Goldparmäne [Golden Pearmain] were grafted on to rootstocks MIX, MIV and MXI, those from the younger seedlings continued their growth in the juvenile form whereas shoots produced from buds taken from the upper parts of four-year old seedlings flowered earlier than the seedlings themselves. Results obtained with MIX were considerably better than with either of the other two rootstocks tested. It is suggested that hormone action is responsible for the continued growth of juvenile forms on roots other than their own and that flowering can be hastened by bud-grafting four-year old seedlings on to MIX.

2762 Ruggiero, R. A.
La floración del manzano y su relación con las temperaturas invernales en el Alto Valle del Río Negro. (**The flowering of the apple tree and its relationship with winter temperatures in the upper valley of the Río Negro**).
Meteoros, B. Aires 1955 : **5** : 141–54.

Flowering was delayed when the total number of hours at which the air temperature was below 7° C. fell below a certain minimum and accelerated in proportion to the number of such "cold hours". Varieties differed in their sensitivity to this effect, late varieties being the most sensitive.

2763 Penenžek, Šč.
(**Mičurin's theory on the individual development of plant organisms**).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1955 : **16** : 426–29. [Russian].

Directed training of apple trees for hardiness is discussed from the viewpoint of Mičurinist genetics.

2764 **Develop Jonadel, new apple variety.**
Iowa Fm. Sci. 1956 : **10** : p. 180.

The fireblight resistant seedling Ames 611 (cf. *PBA*, XXV, Abst. 2320) has been introduced as Jonadel. It was developed from Jonathan x Delicious.

2765 Jaarverslag van de werkzaamheden verricht in het jaar 1953 op het centrale bemestingsproefveld voor de fruitteelt "De lange Ossekampen" Wageningen. (**Annual report of the activities at the central manuring trial field for fruit cultivation "De lange Ossekampen", Wageningen, during 1953**).
Pp. 121.

Information is included on the results of variety trials of pome fruits and on differences in the susceptibility of a wide range of apple varieties grown in the Netherlands to attack by *Podosphaera leucotricha*, *Nectria galligena*, *Venturia inaequalis* and other diseases.

2766 TERMOHLEN, G. P.
Schurftresistentie in appels. (**Scab resistance in apples**).
StudKring. Plant Veredel. Wageningen. Versl. 1954 : 561–68.
[Euphytica, Wageningen 1955 : **4** : p. 255. (Abst.)].

In the USA, fourth or fifth back-cross generations combining the scab resistance of wild *Malus* species with the large fruits of cultivated forms have been obtained. In Germany, resistant material has been produced by selection from open pollinated varieties. The appearance of new races of the fungus through introduction of foreign races, genetic recombination by sexual reproduction, adaptation and mutation is discussed briefly.

2767 **New pear varieties.**
Amer. Fruit Gr. 1956 : **76** : No. 3 : p. 66.

The following varieties have shown promise in New York State: Chapin, an open-pollinated seedling of Seckel, with a long period of picking, beginning in August; two seedlings of Bartlett; Gorham, a Bartlett type ripening two weeks later than Bartlett; and Ewart and Dumont, late ripening pears with good quality.

2768 PIROVANO, A.
Due nuove pere estive: Mora (I.P. 112) e Itala (I.P.999). [**Two new summer pears: Mora (IP112) and Itala (IP999)**].
Frutticoltura, Bologna 1956 : **18** : p. 24.

Itala is a hybrid of Beurré Clairgeau x Williams; it bears large fruits with an average weight of 245 g., of excellent flavour and aroma, is resistant to fungal attack, yields well and ripens some 20 days before Williams.

Mora is a hybrid produced by applying pollen of Martin sec [Dry Martin] subjected to X irradiation to Beurré Clairgeau; it bears rust-coloured fruits weighing 200 g. with cream-coloured, sweet, slightly aromatic flesh. It gives very regular yields and is resistant to *Venturia* sp. In type it resembles Kaiser but is earlier in ripening.

2769 OLDÉN, E. J.
Observationer bland stenfruktträden vid Balsgård efter vintern 1954–55. (**Observations on stone-fruit trees at Balsgård after the winter of 1954-55**).
Sverig. pomol. Fören. Årsskr. 1955 : 47–67.

The reactions of numerous sweet cherry, sour cherry and plum varieties to a period of severe frost at Balsgård, Sweden, during February-March 1955 are described in detail. Flower buds were less hardy than leaf buds. Varieties resistant to frost damage occurred in each group, a number of diploid plum seedlings of Assiniboine, a variety originating from *Prunus nigra*, being completely free from damaged flower buds. In many cherry hybrids, frost caused deformation of leaves and bifurcation of shoots, but no bifurcations were observed among the progenies of sour cherries x sour cherries or sour cherries x duke cherries. No intervarietal differences in hardiness of peaches were observed, the buds of all varieties being destroyed by frost.

2770 HERSHKOVITZ, E.
(**Apricots**).
Sadeh (Field)/Hassadeh 1954 : **34** : 418–20. [Hebrew].

Local varieties of apricots grown in Israel include: Alawi, ripening at the beginning of May; Khlabi, ripening some days later, and Mustakawi and Louzi, both ripening in June. Early varieties usually escape infestation by the Mediterranean fruit fly. They are desirable also because there are no other fruits in the local market in May.

2771 FEDORENKO, M. M.
(**Using I. V. Mičurin's methods**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 12 : 56–58. [Russian].

The new plum Renklod Krošnjanskiĭ [Krošnja Gage] from the Žitomir province is notable for good regular cropping and large yellow fruits with flesh of good flavour. Mention is made of a productive winter-hardy peach Žitomir 17, a seedling of Nektarin Želtyĭ [Yellow Nectarine]. It was raised from a stone that had been subjected alternately to frost and room temperatures.

2772 OLDÉN, E. J.
Hybridiseringsförsök inom plommongruppen. (**Hybridization experiments in the plum group**).
Sverig. pomol. Fören. Årsskr. 1955 : 155–74.

The results of interspecific hybridization experiments conducted at Balsgård, Sweden, during the period 1946–55 are reported. In crosses between diploids, the highest fruit sets were obtained from the two female parents Beauty, a *Prunus salicina* hybrid, and *P. sibirica*; Beauty was also the only diploid to set fruit when pollinated by pentaploids, two diploids and a triploid all resembling the female parent being produced. Among other successful crosses were: (1) those using the tetraploid *P. spinosa* (sloe) as male parent and diploid varieties as female, a particularly large number of triploids being obtained from a Myrobalan tree ($2n$) pollinated by sloe; (2) crosses between hexaploids (♀) and diploids, the progenies consisting of a number of tetraploids, one pentaploid and one octoploid; (3) the cross Morden 123 ($3n$) x Early Laxton ($6n$), giving pentaploid and aneuploid hybrids; (4) crosses between pentaploids and hexaploids, from which several octoploids were obtained; and (5) an octoploid pollinated by hexaploids to produce heptaploids and aneuploids. The triploids from (1) are expected to be of use in improving hardiness and the colour and the flavour of the fruit in hexaploid plums.

2773 WILLIAMS, W.
Gene frequencies in the cultivated sweet cherry.
Heredity 1955 : **9** : p. 419. (Abst.).

The cultivated cherry population carries genes conferring no apparent phenotypic selective advantage in frequencies far exceeding those expected on the basis of chance. It is suggested that either the cultivated sweet cherry has originated from a small genetic pool or the chromosome regions involved affect fruit quality, thereby providing the genotype with a selective advantage.

2774 HRUBÝ, K.
Hybridní rostliny z exstirpovaných embrií. (**Hybrid plants from excised embryos**).
Biológia, Bratislava 1954 : **9** : 531–43.

Embryo excision has been used in Czechoslovakia to facilitate germination of *Prunus cerasus* x *P. mahaleb*.

2775 MALIGA, P.
Untersuchungen über die Befruchtungsverhältnisse bei Weichselsorten. (**Investigations on the fertility relationships of sour cherry varieties**).
Acta agron. 1954 : **4** : 105–49.

In a series of investigations carried out between 1942 and 1952 by the University of Agricultural Science, Budapest, the following compatibility relationships were established in Pándy and other sour cherries: (1) Pándy and many other varieties were self incompatible; Imperial Morello, Anglaise hâtive [Early English], Montreuil and English Bearer were self compatible and Large Montmorency partly so, the degree of self compatibility varying in different years; (2) Pándy pollen is produced in small quantities only so that although it is compatible with King Amarello, Imperial Morello, Empress Eugenie, May Duke, Montreuil, English Bearer and Large Montmorency the variety is not a useful pollinator under conditions of natural pollination; (3) fruit set on Pándy was 5–10% with May Duke, Large Montmorency, Montreuil or Germersdorf sweet cherry as pollinators, 10–20% with King Amarello, Empress Eugenie, Anglaise hâtive, English Bearer and the sweet cherries Olivet and Badacsonyi óriás [Badacsony Giant] and above 20% with the sweet cherries Magyar porc [Hungarian Cartilage] and Mark Early. Sweet cherries and sweet cherry x sour cherry hybrids were generally better than sour cherries as pollinators for Pándy.

Details are also given of the flowering times of the varieties studied, Pándy being a medium-late cherry.

2776 CAPUCCI, C.
Due nuove selezioni di pesco C. Capucci n. 19 e n. 20. (**Two new peach selections, C. Capucci 19 and 20**).
Frutticoltura, Bologna 1955 : **6** : 491–500.

Further information is presented on the behaviour of some of the author's peach selections (cf. *PBA*, XXI, Abst. 1318) in different parts of Italy and under different conditions of soil and climate and two further varieties are described. No. 19, a seedling of S. Anna, ripens 10–15 days after Hale, with fruits weighing from 150 to 250 g., round with cream-coloured flesh, good flavour and free stone; the tree is vigorous and bears heavy yields.

No. 20, a seedling of Hale, ripens 30–35 days before Hale, bearing fruits weighing from 105 to 305 g., with yellow flesh, aromatic flavour and free stone.

2777 RODIONOV, A. P.
(**Conditions for developing hardiness in peach seedlings**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 12 : 47–48. [Russian].

Peach seedlings showing resistance to frost injury to the buds have been selected at Kiev. They were raised from nonvernalized or partially vernalized stones of Kievskiĭ 1973 [Kiev 1973] which had been sown in July.

2778 KLJUČAREVA, M. V.
[**A cytoembryological study of the peach (*Persica vulgaris* Mill)**].
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 150–78. [Russian].

An extended account of the report summarized in *PBA*, XXV, Abst. 1373 is given.

2779 Zorin, F. M.

(Results of breeding citrus crops in the humid subtropics of the Krasnodar area).

Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1955 : **32** : No. 1 : 5–49. [Russian].

Descriptions are given of the Unshu (= Satsuma) and Shiwa mandarins, the clementine, the sweet and sour oranges, the lemon, the grapefruit and the trifoliate orange. Experience in breeding has shown that forms such as the Shiwa mandarin and the trifoliate orange, the characters of which are strongly dominant, should not be used as seed parents; their dominance can be reduced by using pollen from trees that have flowered for the first time. Another Mičurinist technique, that of using mixed pollen of several species, has been successful in increasing the number of seeds produced in pollinations of Unshu. A certain amount of viable pollen has been found in flowers of Unshu developing at Soči during the second period of flowering, in August, and on very small trees; these have been used for pollinating the kumquat and the clementine, which form very few apomictic fruits, thus increasing the chance of producing hybrid progenies. The nucellar seedlings of the Unshu have shown variation in time of ripening, form and flavour of fruit and habit of growth, some of them being up to 15 days earlier than the maternal form; some contained fertile pollen in the flowers and could be used as pollen parents. Nucellar seedlings exceeding the common form in content of both sugar and vitamin C have been obtained.

The Mičurin principles of tending the seedlings are outlined and instances are cited where the characteristics of young hybrid seedlings have been changed by alterations in external conditions. In several interspecific crosses certain characters that were absent in both the parents appeared among the progeny.

The various interspecific hybrids produced varied in the time at which they flowered, the earliest being an orange x grapefruit hybrid which flowered at the age of two months, when it was only 2·5 cm. high. Though time of flowering can be controlled by grafting, the hybrids of *Poncirus trifoliata* x Unshu, Shiwa x Unshu, mandarin x Meyer's lemon and the seedlings of Shiwa are the earliest. Hybrids of frost-resistant mandarins with kumquats, *P. trifoliata* and Shiwa and of *P. trifoliata* with lemons were mostly frost resistant.

A number of plants are described which, having originated from grafts between two different species or types, exhibit characters of both, or in certain cases new characters not present in either component. By grafting an interspecific hybrid on to a third species attempts are being made to combine the characters of all three components.

The capacity for somatic mutation has not been found to be so high as had been expected from the literature and no useful sports have been observed so far. Some of the new hybrid seedlings are recommended for their effect in increasing the hardiness of their scions, and others for fruit production, their main characteristics being described. They include hybrids 2004 (Unshu x orange), with acid-sweet, almost seedless fruits with a flavour resembling an orange but rather thick skins; 3 (Unshu x orange), with fruits weighing 80–120 g., having an acid flavour resembling both an orange and a mandarin; 3008 (Unshu x grapefruit), with fruits weighing up to 200 g. and resembling the mandarin in flavour; 218 (Unshu x Natsumikan [Summer mandarin]), with fruits weighing 200–300 g. and having juicy flesh with a fine, sweetish-acid flavour with a trace of astringency; 320 (Unshu x Shiwa), a high-yielding seedling bearing up to 700 small fruits at a time and exceeding the Unshu in both earliness and hardiness; 11 (Unshu x clementine), with small, sweet, slightly acid fruits; 118 (orange x clementine), with fruits the same size as the Georgian orange, with good sweet flavour, being equal to Unshu in hardiness and earliness; 88 and 338 (kumquat x lemon), having fruits with the flavour of a lemon with a slight suggestion of the kumquat aroma; 37 (Unshu x lemon) which comes into fruit early, bears small fruits of agreeable flavour and is useful for back crossing with the lemon; and 78 (kumquat x Unshu), with bright orange-coloured fruits of sweetish-acid flavour, which is much hardier than Unshu and promising for back crossing with the lemon. All the above hybrids are equal to Unshu in hardiness and some excel it.

Orange 2006 was obtained by pollinating the local Georgian orange with mixed pollen from a number of orange varieties and grafting on to Unshu; it is equal to the Georgian orange in hardiness but excels it in fruit quality and ripens earlier. Seedling 2007, from the same combination, is distinguished by the quality of its fruits. The mandarin Soči A–23, which was selected from nucellar seedlings of Unshu, from which it differs by having 9% of sugar in the fruits as against 6–7%, ripens a week earlier and has a higher yield.

2780 Noro, K.
[On the Takagi mandarin, a graft hybrid of Kinkoji (*Citrus leiocarpa* Tanaka) and the Unshu mandarin (*C. Unshiu* Marc)].
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1955 : **6** : 80–84. [Japanese].

A description is given of the above graft hybrid which arose in a citrus orchard in Tokushima prefecture, Japan. The fruits are flattened and seedless and have thin adherent skins.

2781 Russo, F.
Introduzione presso la Stazione Sperimentale di Agrumicoltura di Acireale di specie, varietà e ibridi di agrumi e specie affini in gran parte inesistenti presso le collezioni italiane. (**Introduction at the Citrus Experimental Station at Acireale of species, varieties and hybrids of citrus and allied species mostly absent in the Italian collections**).
Riv. Agrumicolt. 1956 : **1** : 133–38.

Reference is made to the excellence of the citrus collection at the Citrus Experiment Station at Riverside, Calif., and a list is given of the material introduced from there into the Italian collection at Acireale. This includes some of the newer hybrids resistant to tristeza and *Phytophthora*, some rootstocks resistant to saline or sulphurous soils, and seeds of all lemon clones in the hope of finding seedlings resistant to mal secco (= wither tip).

2782 Bitters, W. P.
Citrus variety collections at Riverside.
Calif. Citrogr. 1955 : **40** : 162, 176–78.

Information is given on species and varieties included in the collection at the Citrus Experiment Station of the University of California, Riverside.

2783 Hodgson, R. W.
Citrus introductions at UCLA.
Calif. Citrogr. 1955 : **40** : 164, 172–75.

A report is given of work carried out during the past 25 years by the Department of Subtropical Horticulture, University of California, Los Angeles, on the introduction of a wide range of citrus fruits. Many introductions show promise as possible commercial varieties. Some problems of botanical relationships and synonymy have been elucidated.

2784 Darley, E. F. & Wilbur, W. D.
Testing for resistance to Armillaria root rot.
Calif. Citrogr. 1954 : **40** : 291, 306.

Of eight citrus varieties inoculated with *A. mellea* at the University of California Citrus Experiment Station, two remained free of infection. Further tests on citrus and avocado varieties are in progress.

2785 Oberholzer, P. C. J. & Hofmeyr, J. D. J.
The nature and control of clonal senility in commercial varieties of citrus in South Africa.
Fac. Agric. Univ. Pretoria 1955 : Pp. 46.

Among the measures considered as possible methods of counteracting clonal decline is use of nucellar seedlings, in connexion with which a discussion of the genetical aspects of bud variation is included. It is suggested that an alteration in the genotype may result in increased or decreased resistance, symptom expression being correlated with virus concentration. If a genetic change is unfavourable to virus multiplication, mutant buds may become virus free; in this way the observed occurrence of apparently virus-free buds on trees afflicted with tristeza may be explained.

2786 Arias, J. M.
Rio Secundo, une nouvelle variété de mandarine. (**Rio Secundo, a new variety of mandarin**).
Fruits, Paris 1955 : **10** : No. **3** : p. 135.

The above variety was obtained from a graft of a Japanese mandarin on the Rangpur lime made by the author in Aljeula, Costa Rica. The skin separates easily from the flesh, the latter having a fine flavour and an aroma reminiscent of peaches. The fruits keep well.

2787 Guseva, E. I.
(**Biological characteristics of the Unshu mandarin**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1955 : **32** : No. 1 : 50–77. [Russian].

An account is given of the attempts to introduce the Unshu (= Satsuma) orange into the Black Sea area and elsewhere in the Soviet Union and brief descriptions are given of the many forms now found in cultivation; they differ in time of ripening, habit, yield, size and quality of fruit, keeping capacity and above all in frost resistance. Differences in earliness are responsible also for differences in the behaviour of the trees on grafting. The large-leaved forms are found to be the hardiest and the most valuable agronomically.

A full description is given of the different types of shoots formed at different stages of development.

2788 Ivanovskaja, T. L.
(The fruiting of lemon seedlings under Moscow conditions).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 83–91. [Russian].

Seedlings that have reached the fruiting stage at the Institute of Genetics include one that supplied seed for a second generation. Selection among seedlings is regarded as an effective method of breeding new varieties, especially as the seeds of a fruit may give progeny with different characteristics.

2789 Anjaneyulu Naidu, N.
Preliminary studies on the occurrence of self sterility in the Italian, Nepali, Oblong and Lucknow seedless lemons *Citrus limon* (Linn) Burn.
Andhra agric. J. 1955 : **2** : 236–40.

The above varieties are cross fertile with Lisbon, self incompatible and parthenocarpic.

2790 Kokonov, M. T.
(Methods of breeding lemons. Fasciations).
Izv. Timirjazev. seljskohozjaĭstv. Akad. (News Timirjazev agric. Acad.) 1955 : No. 2 : 77–102. [Russian].

Instances of fasciation in various economic plants, including those observed by the present writer on apples and lemons at the Timirjazev Horticultural Research Station, are reported and the phenomenon is discussed in relation to bud mutations and selection of large-fruited forms. It is stated that the fasciations of greatest practical value in the lemon arise from coalescence of axillary or dormant buds with adventitious buds or of coalescence between sexual and nucellar embryos. Data showing improvements in the fruits of the lemon Novogruzinskiĭ [New-Georgian] arising from fasciated flowers with 10, 15 and 20 petals are presented. The fruits were twice the normal size, and had a higher sugar and acid content. Many large-fruited forms of lemon have been selected by this method at the institute.

2791 Baldini, E. & Scaramuzzi, F.
Contributo ad una indagine pomologica sulle cultivar di diospiro. **(Contribution to a pomological study on cultivars of persimmon).**
Ann. Sper. agr. 1956 : **10** : No. 1 : Suppl. : xli–lxviii.

Some general information is given on the genus *Diospyros*, and its introduction into Italy and various attempts at classification of the species and cultivated varieties are outlined. The present study takes into account astringency of the fruit with and without fertilization, vigour, growth habit, form of leaves, fruit and seeds and the sex of the floral organs, as well as biological features such as time of flowering and ripening. Descriptions are given of nine varieties of *D. kaki* grown in Italy, with illustrations and indications of their horticultural value.

2792 Ozols, A. & Lazareva, A.
(Directed changes in the modes of photosynthesis and respiration in acclimatization of the walnut).
Latv. PSR Zinãt. Akad. Vestis 1954 : **8** : 27–38. [Russian].

Data on respiration rates for some forms of walnut introduced into Moscow from other Soviet territories are presented and discussed in relation to directed changes which have occurred in the plants with regard to growth, development, dormancy period and winter hardiness.

2793 Romberg, L. D.
A progress report on pecan breeding.
Annu. Mtg. Tex. Pecan Gr. Ass. 1955 : **34** : 54–55.

Comments are made upon breeding at the US Pecan Field Station, Brownwood, Tex. Information has been obtained on floral biology and techniques have been devised for artificial hybridization. Breeding material in hand is briefly described.

2794 **A new pecan for the north.**
Amer. Fruit Gr. 1956 : **76** : No. 3 : p. 38.

Introduced by Stark Bros. Nurseries, Louisiana, Mo., the thin-shelled variety Starking Hardy Giant requires only 140–150 days to produce ripe nuts. It is therefore expected to extend the area of commercial cultivation of the pecan in the northern part of the USA.

2795 Evreinoff, V. A.
Le pistachier (étude pomologique). **[The pistachio (a pomological study)].**
J. Agric. trop. Bot. appl. 1955 : **2** : 387–415.

Varieties of *Pistacia* grown in Central Asia, the Mediterranean area and the USA are described briefly.

2796 Bunting, A. H.
A classification of cultivated groundnuts.
Emp. J. exp. Agric. 1955 : **23** : 158–70.

A collection of over 200 varieties and selections of *Arachis hypogaea* grown in Tanganyika and the Sudan could be divided into two groups on the basis of two distinct types of branching described as sequential and alternate; the groups also differed in habit, foliage colour, length of growing season and seed dormancy. Further subdivision of the two groups according to kernel and pod characteristics led to the recognition of 22 distinct groups, a field key to the identification of which is provided.

2797 LING [LIN], H.
(Studies on peanut characters and their correlations).
Nungyeh Yenchiu/Agric. Res., Taipei 1954 : **4** : No. 4 : 46–67. [Chinese].

A detailed study was made of 26 botanical and agronomic characters in a series of 60 local and introduced varieties of the Spanish type. Among the characters investigated were plant dimensions, degree of branching, pigmentation, hairiness, leaf size, nodulation, disease resistance, and yield of pods and seeds. The characters number of pods per plant, weight of pods per plant, number of seeds per plant and weight of seeds per plant were all highly correlated.

2798 JOHN, C. M. & SATYABALAN, K.
A note on the important coconut varieties of the Laccadive Islands.
Indian Cocon. J. 1955 : **8** : 65–73.

Descriptions are given of the economic characters of the three principal varieties grown in the Laccadive Islands as manifested at the Kasaragod Central Coconut Research Station on the Indian mainland. These varieties are of interest for such characteristics as high rate of spathe production and high oil content; they are being employed in the hybridization programme of the Kasaragod station.

2799 CASTORINA, S.
Le varietà d'olivo coltivate in Abruzzo. Parte II. **(The olive varieties cultivated in Abruzzo. II).**
Ann. Sper. agr. 1956 : **10** : No. 1 : Suppl. : i–xxvii.

Descriptions of 14 further, less common, varieties are presented (cf. Abst. 1761).

2800 NORO, K.
Preliminary report on the nucleus division and chromosome numbers in the *Olea europea* L.
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1953 : **4** : 180–84.

Meiosis was studied in the varieties Mission and Manzanillo. All stages were regular; $n = 23$.

2801 BALDINI, E. & SCARAMUZZI, F.
Ulteriori indagini sulla validità del metodo bio-statistico nella descrizione e classificazione delle cultivar di olivo. **(Further research on the validity of the biostatistical method for describing and classifying olive varieties).**
Ann. Sper. agr. 1956 : **10** : 171–86.

Observations were made on 36 cultivars in three different localities in Italy and tabular data are given on dimensions of their leaves, fruits and stones. As in the previous study (cf. *PBA*, XXIII, Abst. 1454), differences between the values for the same variety in different years were statistically significant and often greater than those between varieties; the previous conclusion that such biometric data have only supplementary value in identifying and classifying cultivars is thus confirmed. The varietal index calculated by the method proposed by Di Prima (cf. *PBA*, XXV, Abst. 515) for the same plant in different years displayed similar variations and is regarded as invalid.

2802 NORO, K. & INOUE, T.
(The oil content and yield of oil per tan* of olive varieties).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1952 : **4** : 132–35. [Japanese].

Data are provided on the oil content of a series of introduced varieties under trial at the Shozu branch station of the Kagawa Agricultural Experimental Station. Comparative figures for the oil contents of the same varieties in California, France and Australia are also given.

2803 ARÓSTEGUI, F., ASENJO, C. F., MUÑIZ, A. I. & ALEMAÑY, L.
Observations and data on a promising selection of the West Indian cherry, *Malpighia punicifolia* L.
J. Agric. Univ. PR 1955 : **39** : 51–56.

The substance of this article has been summarized in *PBA*, Vol. XXV, Abst. 3396.

2804 ROUNDS, M. B.
Report of the Avocado Variety Committee annual meeting 1955.
Yearb. Calif. Avocado Soc. 1955 : **39** : 21–26.

Varieties recommended for commercial planting in 1955 are listed and descriptions are given of important experimental varieties.

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* 1 tan = *ca.* 0·1 ha. = 0·245 acre.

2805 WINSLOW, M. M. & ENDERUD, J.
Flowering behaviour and yields of some avocado varieties at Riverside.
Yearb. Calif. Avocado Soc. 1955 : **39** : 133–35.

Notes on the flowering dates, heaviness of flowering and the yields of ten varieties at Riverside, Calif., during the period 1951–52 are presented.

2806 **Avocado varieties registered in 1954.**
Yearb. Calif. Avocado Soc. 1955 : **39** : 27–28.

Descriptive notes are given on the variety Famosa and the hybrids Allmeat, Clotilde, Grano, Mario and Mitto.

2807 SCHROEDER, C. A.
Pollen production in avocado.
Yearb. Calif. Avocado Soc. 1955 : **39** : 184–86.

The average quantities of viable pollen produced by individual flowers of 13 commercial varieties in California were adequate for setting fruit, indicating that factors other than quantity of pollen are responsible for occasional crop failures.

2808 STOREY, W. B.
Evaluation of Avocado varieties and rootstocks.
Yearb. Calif. Avocado Soc. 1955 : **39** : 146–48.

The work of the Avocado Variety Committee in evaluating varieties and rootstocks is outlined. Methods of propagating rootstocks clonally are being investigated.

2809 LINDGREN, D. L., SINCLAIR, W. B. & STUPIN, P. J.
Tolerance of avocado fruits of different varieties to fumigation with ethylene dibromide.
Yearb. Calif. Avocado Soc. 1955 : **39** : 202–08.

Fruits of Fuerte were tolerant of fumigation with dosages of 1, 2 or 3 lb. of ethylene dibromide per 1000 ft.^{3} for two hours, while MacArthur, Anaheim and El Trópico fruits were undamaged by 1 lb. dosages but were injured by higher dosages. A four-hour exposure to 1·5 lb./1000 ft.^{3} caused injury to Fuerte fruits.

2810 WALLACE, A., SHANNON, L. M., NORTH, C. P. & MUELLER, R. T.
Glasshouse studies on the salt tolerance and growth of *Persea floccosa* as a rootstock.
Yearb. Calif. Avocado Soc. 1955 : **39** : 179–83.

P. floccosa and three varieties of *P. americana* were tested for salt tolerance both as cuttings and as rootstocks for the variety Fuerte. All the cuttings and graft combinations showed some injury when sodium chloride was added to the soil and accumulated both $Na^{\cdot}$ and Cl' in the leaves, branches and roots.

2811 SCHROEDER, C. A.
New avocado research materials from Mexico—1954.
Yearb. Calif. Avocado Soc. 1955 : **39** : 89–91.

A few Mexican forms collected with the aim of finding material resistant to *Phytophthora cinnamomi* are briefly described.

2812 ZENTMYER, G. A. & SCHROEDER, C. A.
Further evidence of resistance to Phytophthora rootrot of avocado.
Yearb. Calif. Avocado Soc. 1955 : **39** : 84–86.

Persea borbonica and *P. skutchii* have shown high resistance and cuttings from a seedling of Duke appreciable resistance to *Ph. cinnamomi* under field conditions.

2813 HALMA, F. F., ZENTMYER, G. A. & WILHELM, S.
Verticillium wilt of avocados.
Calif. Citrogr. 1954 : **40** : 69–70.

The results of field observations, inoculation tests and rootstock tests on naturally infected trees in California indicate that Mexican rootstocks are less susceptible than Guatemalan to *Verticillium albo-atrum.*

2814 VAANDRAGER, M. H.
Een bramenras met grotere bedrijfszekerheid. **(A blackberry variety with greater commercial dependability).**
Fruitteelt 1955 : **45** : p. 1074.

The variety Parsley leaved (= Oregon Evergreen) is recommended for cultivation in the Netherlands. It possesses greater resistance to frost and stalk diseases than Himalaya, the variety most widely cultivated at present, but ripens some 14 days later and gives somewhat lower yields.

2815 Rassenproeven met zwarte bessen. **(Variety trials of black currants).**
Fruitteelt 1956 : **46** : p. 58.

Black Smith, Ogden's Black, Roodknop [Red bud] and Seabrook's Black gave the highest yields in trials at the Beesel Horticultural Station, Netherlands. Roodknop and Lee's Prolific possessed most resistance to night frosts.

2816 Nilsson, F.
Hybrider inom släktet *Ribes*, undersläktet *Coreosma*. (**Hybrids in the genus *Ribes*, subgenus *Coreosma***).
Bot. Notiser 1956 : **109** : 33–49.

In work carried out at Alnarp, Sweden, the progeny of *R. nigrum* x *R. sanguineum* was uniform and intermediate between the parents in most characters and bore round, sweet, glabrous fruits. Both male and female fertility were reduced but back crossing to *R. nigrum* was readily effected, the back-cross progenies being highly variable with a few fully fertile, sweet-fruited plants in the second back-cross generations. The crosses *R. nigrum* x *R. aureum* and *R. aureum* x *R. sanguineum* gave completely sterile F_1 hybrids varying greatly in vigour and other characters, but attempts to cross *R. sanguineum* with *R. aureum*, using the former as seed parent, were unsuccessful.

2817 Nouveauté: un fraisier grimpant. (**Novelty: a climbing strawberry**).
Rev. hort., Paris 1956 : **128** : p. 1423.

The variety Truffaut Prodige [Truffaut Prodigy], a climbing strawberry developed in France, is described briefly. It attains a length of 2 m., grows vigorously, is resistant to cold and produces high yields of attractive fruits.

2818 **A new strawberry named Jerseybelle.**
NJ Agric. 1955 : **35** : No. 5 : p. 10.

Jerseybelle, a vigorous variety with large, firm and attractive fruits suitable for freezing and of good dessert quality, was developed at the New Jersey Agricultural Experiment Station from a cross involving Fairfax, Lupton, Aberdeen and Pathfinder.

2819 Duka, S. H.
(**The training of hybrid strawberry seedlings**).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1955 : **16** : 397–404. [Russian].

The F_1 of 182A x Kievskaja Rannjaja [Kiev Early] and other hybrids raised upon subsandy soil at Burakovščina were characterized by greater earliness and better flavour than hybrids trained upon rich moist soil at Metstancija. The latter however were distinguished by large fruit. Fruit size and flavour were not positively correlated. Data showing the percentages of plants producing ripe fruits on various dates from 7 June to 21 June for a number of hybrids grown on the two types of soil are presented, also data showing positive correlation between the soil type and earliness and soil type and fruit size for the hybrids 182A x Kievskaja Rannjaja 2 and 97A x Kievskaja Rannjaja 2.

2820 Darnay, E.
A szőlő pótbeporzásakor jelentkező metaxénia. (**Metaxenia following supplementary pollination in grapes**).
Növénytermelés 1954 : **3** : 67–76.

Studies of supplementary pollination of Hamburg Muscat, carried out at the Mathias experimental vineyard, Kecskemét, Hungary, showed that flavour, bouquet, sugar and acid content and weight of the fruits were markedly influenced by the pollen variety.

2821 Cosmo, I. & Polsinelli, M.
"Pinella".
Ann. Sper. agr. 1956 : **10** : No. 1 : Suppl. : xxix–xl.

The vine described is grown in the Padua area of northern Italy, where it is popular on high ground on account of its good yield of white grapes suitable for wine making.

2822 Bruni, B.
"Montepulciano".
Ann. Sper. agr. 1956 : **10** : No. 1 : Suppl. : lxxxv–xcv.

An examination of the vines that go under the name of Montepulciano in Italy has shown them to be distinct from the vine Sangiovese with which they are sometimes identified. The variety Montepulciano, which is described, is more tolerant of cold and low fertility and produces a wine of medium quality suitable for blending.

2823 **A new muscadine variety.**
Seed World 1955 : **77** : No. 10 : p. 10.

Developed at the Georgia Agricultural Experiment Station, the self-sterile variety Higgins (Yuga ♀ x white type ♂) is considered to merit introduction on account of its compact clusters of large bronze-coloured fruits, high yielding capacity and moderate resistance to black rot. The variety is a midseason type.

2824 Märker, H.
Überlegungen zur Grösse der Teilstücke im weinbaulichen Feldversuch. (**Considerations on the size of plots in viticultural field trials**).
Züchter 1956 : **26** : 53–60.

A uniformity trial of 12 x 90 plants of Riesling 5BB is analysed. By calculating the mean difference between individual plant yields and the mean of each serial group of 10 plants along the row to which it pertained, a correction figure was obtained for each plant. When plotted for an entire row, these correction figures provided an indication of environmental heterogeneity. The number of plants required per plot ranged from 201 to 32 with 2 to 9 replications and 8 plots, and 182 to 70 with 2 to 50 plots and 4 replications.

2825 CANDELA MANZANEQUE, M. R.
Revisión del estado actual de la genética de la vid. (**Revue of the present position of the genetics of the vine**).
Bol. Inst. Invest. agron., Madr. 1955 : **15** : 335–73.

A review is given of the published literature on the inheritance of characters, chromosome numbers in *Vitis* spp. and related genera, the main results of breeding vines for improvements in various characters, more particularly resistance to fungous and insect diseases, and the identification of rootstocks morphologically. The author shares the opinion that resistance to phylloxera and mildew can be obtained in crosses within *Vitis vinifera* but both are dependent on multiple genes; vegetative multiplication is not itself regarded as the direct cause of degeneration. The review ends with a list of the main centres of research on genetics and breeding of vines in different countries of the world.

2826 KUZJMIN, A. I.
(**The formation of economic characteristics in the vine variety Nagrada**).
Priroda (Nature), Leningrad 1956 : No. 1 : 98–100. [Russian].

Mičurin's thesis that young hybrids are hereditarily unstable and that external conditions may condition their economic characters is set forth. The statement is supported by a description of changes observed in the new variety Nagrada [Reward] from Mičurinsk, which was obtained by interspecific hybridization involving *Vitis amurensis*, *V. labrusca* and *V. vinifera*. The changes included improvements in bunch weight and berry size. The colour of the berries changed twice within a few years. Nagrada is hardy and productive and ripens in all seasons at Mičurinsk. It shows resistance to downy mildew and is not liable to small berry formation.

2827 LOLADZE, V. R.
(**Rkaciteli with red grapes**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 12 : 66–68. [Russian].

A bud mutation of Rkaciteli with red berries, higher yield and improved sugar content is reported from Georgia. Fixing the new form involved the use of Saperavi as a mentor.

2828 **Big grapes coming.**
Agric. Res., Wash. 1955 : **4** : No. 6 : p. 12.

Colchicine-induced, large-fruited tetraploids of Loretto (*Vitis labrusca*) and of two muscadine varieties show promise for the south of the USA. Perfect-flowered lines of disease-resistant muscadines are being developed. Colchicine-induced tetraploids of these are then to be crossed with varieties of *V. labrusca* and *V. vinifera* to develop disease-resistant bunch types for the south.

2829 MANZO, P.
L'uva precocissima "Anna Maria" e le sue caratteristiche. (**The very early grape Anna Maria and its characteristics**).
Riv. Vitic. 1956 : **9** : 3–6.

The Anna Maria grape was produced by crossing Pirovano's David with Perle de Csaba; it combines the high yield of large fleshy fruits, with firm skin and muscat flavour, of David with the earliness of Perle de Csaba; the fruits are very firmly attached and are suitable for transport. The variety is described and indications are given of the rootstocks and cultural conditions suitable for it.

2830 POSPÍŠILOVÁ, D.
Umelé doopel'ovanie vínnej révy. (**Artificial supplementary pollination of vines**).
Pol'nohospodárstvo 1955 : **2** : 420–24.

Artificial supplementary pollination raised the yield but decreased the sugar content of vines in Czechoslovakia. Success depends on the variety.

2831 IVANOVA, E. B.
(**Utilizing hybrids with flowers of the male type for artificial pollination**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 1 : 42–45. [Russian].

The use of pollen of vine hybrids with ♂ flowers for supplementary pollination of perfect-flowered varieties susceptible to abortion of inflorescences and of varieties with ♀ flowers is advocated. The pollen of some hybrids of *Vitis amurensis* with male flowers from the Magarač Institute remained viable for several days. The hybrids had been previously selected for hardiness, early flowering and large inflorescences.

2832 BAŠIROV, F. B.
(**The question of expanding the cultivation of dessert grapes in the USSR**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 12 : 62–66. [Russian].

An expansion of dessert varieties in all viticultural districts is urged. The varieties recommended for high quality and good transportability include Nimrang, Taĭfi Rozovyĭ [Pink

Taïfi], Terbaš, Hasaïne and Kara Uzjum Ašhabadskiĭ [Ašhabad Black Grape], all originating from Central Asia, and the Bulgarian variety Karaburnu. Mention is made of successful trials at Odessa of a number of Hungarian and west European varieties.

FORESTRY

2833 MUHAMMAD IHSAN-UR-RAHMAN KHAN
Forest tree breeding.
Pakist. J. Sci. 1955 : **7** : 234–42.

This article has been summarized from another source (cf. Abst. 705).

2834 KNIGGE, A. F.
Forstpflanzenzüchtung auf neuen Wegen. (**Forest-tree breeding along new lines**).
Mitt. dtsch. LandwGes. 1956 : **71** : 136–39.

In this popular account of recent developments in forest-tree breeding the author mentions current difficulties encountered in Germany through the introduction of unsuitable seed of foreign provenance in the 19th century, the selection of plus trees and the founding of seed nurseries, vegetative propagation of élite individuals and the breeding of tetraploid and triploid trees.

2835 BUKŠTYNOV, A. D.
(**To the continued progress of Mičurinist science in forestry**).
Les. Hoz. (Forestry) 1956 : No. 1 : 7–14. [Russian].

The principles of Mičurinist genetics are extolled and economically important forms of forest trees obtained in the USSR in recent years, mainly by wide crossing, are listed.

Walnut. Hybrids of *Juglans regia* with *J. mandshurica*, *J. cinerea*, *J. nigra* and other spp. were all characterized by high nut yield, improved vigour and hardiness.

Hazel. Interspecific hybrids of the wild hazel from Moscow with the cultivated variety Barcelona are winter hardy and produce large nuts.

Oak. New interspecific hybrids of *Quercus macranthera* include forms notable for drought resistance and high rate of growth. Interspecific hybrids of *Q. macranthera* x *Q. suber* proved hardy at Kirovograd.

Poplar. New hardy pyramid-shaped forms of poplar have been produced by crossing *Populus alba* with *P. bolleana*.

Larch. Hybrids of *Larix sibirica* x *L. kamtschatica*, *L. sibirica* x *L. decidua* and *L. decidua* x *L. kamtschatica* all show a 25–50% higher rate of trunk growth than their pure parent species.

Pine. Several interspecific hybrids of *Pinus sylvestris* with a high rate of growth have been developed.

2836 FISCHER, F.
Forstliche Pflanzenzüchtung als ein Mittel zur Steigerung des Waldertrages. (**Forest-tree breeding as a means of increasing forest production**).
Schweiz. Z. Fortw. 1954 : **105** : 165–83.

The author emphasizes the importance of the vegetative propagation of élite clones until such a time as long-term breeding programmes produce results.

2837 LĂZĂRESCU, C.
Metode Miciuriniste de selectie forestiera. (**Mičurinist methods of forest-tree breeding**).
Rev. Pădurilor 1953 : **68** : No. 8 : 3–6.

Tree-breeding experiments in Rumania according to Mičurinist methods are described. They included the grafting of a number of *Quercus* species on to *Q. robur* and the grafting of *Fraxinus pennsylvanica* on to *F. excelsior*. Successful crosses have been effected between *Juglans nigra* and *J. regia*.

2838 PAULEY, S. S.
Natural hybridization of the aspens.
Minn. For. Notes 1956 : No. 47 : unpaginated.

The leaf characteristics of *P. tremuloides*, *P. grandidentata* and their artificial F_1 hybrids are briefly described. In hybrid swarms observed in central and eastern Massachusetts, putative F_2 and back-cross individuals carrying a preponderance of genic material from *P. grandidentata* showed promise, being vigorous and well-formed.

2839 KRZYSIK, F. & GONET, B.
Fizyczne i mechaniczne własności drewa niektórych gatunków i krzyżówek topoli. (**Physical and mechanical properties of the wood of certain poplar species and hybrids**).
Sylwan 1953 : No. 1 : 28–46.

Tabulated data are presented on the percentage of heartwood, moisture content, oven-dry density, tensile strength, specific gravity and shrinkage coefficients of specimens taken from 3 trees of *Populus alba*, 4 of *P. canescens*, 2 of *P. berolinensis*, 3 of *P. tremula* and 2 of *P. deltoides*. Information on the comparative rate of growth of these species and of hybrid progenies of crosses between them is also given. *P. deltoides* gave the best all-round results and its rapid growth would appear to make this species especially suitable for the plantation growing of pulpwood in Poland.

2840 GRAVES, A. H.
Chestnut breeding, a progress report.
Frontiers Pl. Sci., Conn. 1955 : **8** : No. 1 : p. 7.

Blight-resistant selections of the timber type have been obtained at the Connecticut Agricultural Experiment Station by crossing (1) hybrids between Japanese and American species with Chinese chestnuts and (2) Chinese and American species.

2841 NIENSTAEDT, H. & GRAVES, A. H.
Blight resistant chestnuts culture and care.
Circ. Conn. agric. Exp. Sta. 1955 : No. 192 : Pp. 18.

At the Connecticut Agricultural Experiment Station, attempts to improve the resistance of *Castanea dentata* to *Endothia parasitica* have involved hybridization with *C. crenata*, *C. mollissima*, *C. sativa*, *C. henryi*, *C. seguini* and *C. pumila*. The most promising hybrids for forest tree planting, combining blight resistance with desirable tree form, are from crosses between *C. mollissima* and selected F_1 hybrids of *C. crenata* x *C. dentata*. Hybrids between *C. dentata* and *C. mollissima* tend to have either a desirable form combined with intermediate resistance or a poor form together with high resistance. A hybrid of the combination [(*C. crenata* x *C. pumila*) x *C. crenata*] x *C. crenata* shows some promise as a forest tree. As an orchard tree, a hybrid combining the productivity of *C. seguini* with the resistance of *C. mollissima* and bearing kernels of high quality is likely to prove of use in more southern latitudes but is not fully hardy in Connecticut.

At Beltsville Experiment Station, Md., promising hybrids between *C. dentata* and *C. mollissima* have been developed.

The chief varieties of *C. mollissima* recommended for orchard planting are Abundance, Kuling, Meiling and Nanking.

2842 KRAHL-URBAN, J.
Buchenrassenstudien im Bayerisch-Böhmischen Wald, in den Bayerischen Alpen und in den Karawanken. (**Studies of beech races in the Bavarian-Bohemian Forest, in the Bavarian Alps and in the Karawanken Mountains**).
Forst-wiss. Zbl. 1954 : **73** : 309–25.

Two main races, an eastern and a western, are distinguished on the basis of their morphological characteristics. The former is found in the Karawanken Mountains, the latter in the Black Forest and the Bavarian Alps. The beech trees in the Bavarian-Bohemian Forest are mainly of the eastern type (cf. *PBA*, XXV, Abst. 2395).

2843 ČERNAVSKIĬ, S. F. & KRUMBOLJDT, S. N.
(**The problem of botanical varieties of *Fagus orientalis***).
Les. Hoz. (Forestry) 1956 : No. 1 : 40–42. [Russian].

A form of *F. orientalis* found in the north Caucasus is notable for hardiness, rapid growth and white timber of high quality.

2844 BORZA, A.
Über *Fagus orientalis* und *F. taurica* in Rumänien sowie über die Verbreitung zweier Varietäten von *F. silvatica*. (**On *F. orientalis* and *F. taurica* in Rumania and on the distribution of two varieties of *F. silvatica***).
Feddes Repert. 1956 : **59** : 113–16.

The taxonomy and distribution in Rumania of the above three species are discussed. A new form of *F. taurica*, f. *moldavica*, is described. The author does not accept the view that *F. taurica* is a hybrid between the other two species; it is thought more likely to be a component of the *F. orientalis* Formenkreis.

2845 HEJTMÁNEK, J.
O možnostech selekce břízy. (**Possibilities of selection of birch**).
Lesn. Práce 1955 : **34** : 52–57.

It is reported that the principal timber types distinguished among Scandinavian birches also occur in Czechoslovakia and that they can be selected on the basis of their bark characteristics.

2846 LILJEFORS, A.
Cytological studies in *Sorbus*.
Acta Hort. berg. 1955 : **17** : 47–113.

From detailed studies of chromosome behaviour during microsporogenesis in the forms investigated in the work reported in Abst. 2847, genomic formulae are suggested for the different polyploid forms, the three genomes involved being A (*S. aria*), B (*S. aucuparia*) and T (*S. torminalis*). Forms with balanced genomic combinations, such as AAAA, AABB and AATT, are shown to have a wider geographical distribution than those with unbalanced combinations such as AAB, ABB, AAAB, ABBB and ABT. Evidence is presented indicating that in the *S. aria–S. aucuparia* group in Scandinavia, the A genome carries the factor or factors for apomixis and the B genome those for sexuality. It is suggested that hybridization, apomixis and the development of polyploids by fertilization of the egg cell in aposporic embryo sacs have been the most important factors in the evolution of the genus in Scandinavia.

2847 LILJEFORS, A.
Studies on propagation, embryology, and pollination in *Sorbus*.
Acta Hort. berg. 1953 : **16** : 277–329.

Chromosome counts and embryological studies of Scandinavian forms and related types from other parts of Europe are reported and a new triploid apomictic species, *S. teodori*, previously referred to *S. meinichii*, is described. The forms investigated include the four sexual diploid species ($2n = 34$) *S. aucuparia*, *S. aria*, *S. torminalis* and *S. chamaemespilus*, the sexually reproducing triploid hybrid, *S. aucuparia* x *S. hybrida*, and a number of apomictic polyploid species hybrids. Pollination experiments with seven apomicts showed that all were pseudogamous.

2848 SILLANS, R.
À propos de l'*Eucalyptus favieri*. (**A word on *E. favieri***).
J. Agric. trop. Bot. appl. 1955 : **2** : 433–35.

The new frost-resistant *Eucalyptus* originally assumed to have arisen by bud mutation (cf. *PBA*, XVII, Abst. 367) and later shown to have originated as the result of interspecific hybridization between *E. coccifera* and *E. linearis* (cf. *PBA*, XXII, Abst. 3018) is described. A wide range of morphological types were observed in the back-cross F_2.

2849 **Annual Report of the Department of Forestry, Union of South Africa, for the year ended 31st March, 1954**
(1955) : Pp. 38.

Genetical work on forest trees has been temporarily suspended. It is noted that a hybrid between *Pinus sylvestris* and *P. patula* has been secured in Germany with the aid of *P. patula* pollen obtained from Natal. The hybrid is said to be exhibiting marked hybrid vigour.

2850 EDWARDS, M. V.
The hybrid larch. *Larix* x *eurolepis* Henry.
Forestry 1956 : **29** : 29–43.

The history of the parents of the Dunkeld hybrid larch (*L. leptolepis* x *L. decidua*) is surveyed and early and recent information on the hybrid is summarized.

Recent studies of year-old forest plots of the hybrid progenies of open-pollinated Japanese larch confirmed the earlier conclusions, drawn from seedling data (cf. *PBA*, XXIII, Abst. 485), that hybrids of intermediate type tended to be more vigorous than those resembling either the Japanese or the European parents. After three years growth in the forest, differences in height between the intermediate and parental types were no longer significant, but a greater proportion of the hybrids resembling the Japanese parent tended to have leaders with many lateral shoots.

2851 VABRE, A.
L'hybride *Tsugo-Picea hookeriana* et ses parents: étude des plantules. (**The hybrid *Tsugo-Picea hookeriana* and its parents: a study of the seedlings**).
Trav. Lab. for. Toulouse 1954 : **1** : 1–8.

It is confirmed that *Tsugo-Picea hookeriana* (cf. Abst. 1820) is a hybrid from the cross *T. heterophylla* x *P. sitchensis*.

2852 HEJNOWICZ, Z.
O pierwszej chimerze peryklinalnej wśród nagonasiennych. (**The first periclinal chimera among gymnosperms**).
Acta Soc. Bot. Polon. 1956 : **25** : 181–202.

From a study of the stem apex and shoot anatomy of *Juniperus sabina* var. *variegata*, it is concluded that this horticultural variety is a periclinal chimera.

2853 LANGLET, O.
Några data från det internationella granproveniensförsök av 1938 i Sverige. (**Some data on the 1938 international spruce provenance trial in Sweden**).
Skogen 1953 : **40** : 238–39, 244–45.

The author presents a comprehensive analysis of measurements of 14-year old trees grown in southern Sweden from seed obtained from different parts of Europe. Trees of northern provenance, e.g. from Scandinavia, northern Germany and northern Poland, had longer branches than trees of southern and south-eastern provenance, e.g. from the eastern Alps, the Tyrol, southern Poland, the Ardennes and the Auvergne, and commenced their growth earlier in the year. On the basis of the investigations the author concludes that trees of southern provenance and lower altitudes are the best adapted to conditions in southern Sweden.

2854 LI, H.-L.
A horticultural and botanical history of Ginkgo.
Morris. Arbor. Bull. 1956 : **7** : 3–12.

A short account is given of the horticultural history of *G. biloba*. This species appears to occur wild along the border between the Chinese provinces of Anhwei and Chekiang. A number of varieties cultivated for their nuts are recognized at Chuki, in the province of Chekiang.

2855 Holst, M. J.
A provenance experiment in Scots pine (*Pinus sylvestris*).
Silvic. Leafl. Can. 1953 : No. 96 : Pp. 8.

Data on the height and shape of trees grown from seed obtained from different European countries and sown at the Petawawa Forest Experiment Station, Ottawa, in 1940 are provided. Trees of East Prussian, Polish and Latvian provenance gave the best results. Mature plantations grown from seed obtained from these countries in 1930 exist in various parts of eastern Canada and the New England states, so that seed of the above provenance types is readily available.

2856 Mehra, P. N. & Khoshoo, T. N.
Cytology of conifers. I.
J. Genet. 1956 : **54** : 165–80.

Observations on the cytology of 41 species belonging to 14 genera of the Abietaceae, Taxodiaceae and Cupressaceae are recorded. The three families and most of the genera are essentially homoploid. Usually every genus has a characteristic basic caryotype, but in each family some genera are caryotypically similar, e.g. *Picea* and *Tsuga*, *Cryptomeria* and *Cunninghamia* and *Taxodium* and *Sequoiadendron*. Species within a genus may differ in the number and nature of the secondary constrictions and satellites, as in *Pinus* or *Cupressus*, or they may be constant for these characteristics, as in *Callitris*. Evolution in the Coniferales has proceeded by chromosome loss or gain, structural rearrangement and gene mutation. Polyploidy has played an insignificant role.

2857 Mehra, P. N. & Khoshoo, T. N.
Cytology of conifers. II.
J. Genet. 1956 : **54** : 181–85.

The following $2n$ numbers are reported: *Podocarpus falcatus* and *P. gracilior*, 24; *P. latifolia*, 22; and *P. macrophyllus* var. *maki*, 38. In *Cephalotaxus drupacea* and its var. *pedunculata*, $n = 12$.

2858 Saito, Y. & Hashizume, H.
(The effect of high temperature on the formation of abnormal pollen in polyploid specimens of *Cryptomeria japonica*).
Tottori Nogaku Kai Ho/Trans. Tottori Soc. agric. Sci. 1954 : **10** : No. 3 : 136–44. [Japanese].

The frequency of such pollen abnormalities as giant, misshapen or aborted pollen grains in diploid and tetraploid strains of *C. japonica* and under normal and high temperatures (30–45° C.) was investigated. High temperature increases the frequency of pollen abnormalities, the effect being more pronounced in the case of tetraploid trees.

2859 Pauley, S. S., Spurr, S. H. & Whitmore, F. W.
Seed source trials of eastern white pine.
For. Sci. 1955 : **1** : 244–56.

Pinus strobus collections from a number of eastern states in the USA showed clinal variation in growth rate when tested at Petersham, Mass. The occurrence of genetical differences among individual mother plants indicated that selection for vigour together with controlled pollination would be effective.

2860 Schoenike, R. E.
Plastic tubes for controlled pollination of pine.
J. For. 1956 : **54** : p. 135.

Small plastic tubes, 6–12 inches in length, have been found to give satisfactory results in the bagging of pine trees at Crossett, Ark.

2861 Rodger, G. J.
Annual Report of the Forestry and Timber Bureau, Commonwealth of Australia, for the year ended 31st December, 1953 : Pp. 28.
Rodger, G. J.
Annual Report of the Forestry and Timber Bureau, Commonwealth of Australia, for the year ended 31st December, 1954 : Pp. 31.

Work on the selection of long-fibred Monterey pine is being carried out and a number of promising clones have been established. Several individuals obtained from the open pollination of plus trees have shown promise. Some polyploid trees were found in the Australian Capital Territory plantation and added to the station's collection. Pollen from a polyploid tree was used to cross-pollinate several normal trees.

A number of crosses between different species of *Pinus* were effected. Seed from the cross *P. ponderosa* x *P. latifolia* germinated successfully but that of *P. halepensis* x *P. radiata* failed.

2862 Saatçioğlu, F.
Eine neue Varietät von *Pinus nigra* Arnold (*Pinus nigra* Arnold var. *seneriana* Saatçioğlu, var. nov.). **[A new variety of *P. nigra* Arnold (*P. nigra* Arnold var. *seneriana* Saatçioğlu, var. nov.)].**
Z. Weltfw. 1955 : **18** : 1–6.

The above new variety was found near Bolu, in northwest Anatolia, at a height of 1000–1100 m. It is distinguishable from *P. nigra* var. *caramanica* by virtue of its low, round crown and smaller cones and seeds.

2863 Vestlandets forstlige forsøksstation. (**The forest research station of the west**).
Norsk Skogbruk 1955 : 279–80.

Extracts from the 1954–55 report on work carried out in western Norway are presented. Provenance studies of larch and spruce are in progress. The photoperiodic reactions of *Picea abies*, *P. sitchensis*, *Larix decidua*, *L. leptolepis*, *Abies alba* and *A. grandis* from various sources are being studied; spruces of Norwegian origin set fruit satisfactorily under normal day lengths while material from other European sources gave better fruit sets when day length was shortened to 14 hours.

2864 Schulenburg, A. Fr. Graf v.d.
Die spättreibende Tieflandsfichte: eine gegen Spätfröste gefeite Klimarasse. (**The late-flushing lowland spruce: a climatic race proof against late frosts**).
Forstarchiv 1953 : **24** : 196–98.

The author reports the discovery, in 1926, of a stand of Norway Spruce possessing a high degree of resistance to frost. Seeds from trees in this stand, which was situated near Niederlausitz, eastern Germany, were planted out and the seedlings were found to inherit the frost resistance of the parent strain. The fate of the old stand is unknown but trees grown from seed sent to Denmark in 1937 still exist in the trial plots of the Danish Forestry Experimental Station.

2865 Zak, B.
Developing littleleaf-resistant shortleaf pine (*Pinus echinata*).
Sth. Lumberm. 1953 : **187** : 147–49.

A number of partly resistant specimens of *P. echinata* were discovered in Georgia in localities heavily attacked by littleleaf (*Phytophthora cinnamomi*). Short-term laboratory tests for seedling resistance to the pathogen are described; field tests will be conducted later. It is thought that selection of resistant material will prove feasible.

2866 Ahlgren, C. E.
Grafted selections of eastern white pine tested for resistance to blister rust.
J. For. 1955 : **53** : 727–29.

Material selected at the University of Wisconsin for resistance to *Cronartium ribicola* (cf. *PBA*, XIX, Abst. 2141) was grafted on to the rootstocks of commercial seedlings and planted out on a heavily infected island. Percentage infection in the case of the grafted material was 5%, as compared with 58% in the control seedlings. The grafted stock grew more slowly than the seedlings and undesirable prostrate forms occurred. It is concluded that the resistance of many of these selections to *C. ribicola* is satisfactory but that breeding for improved growth rate and tree form is now necessary.

2867 Krzysik, F.
Zagadnienie świerka odpornego na działanie opieńki. (**The problem of the resistance of spruce to *Armillaria mellea***).
Sylwan 1953 : No. **1** : 23–25.

It is suggested that the spruce forests of southwest Poland contain material resistant to *A. mellea* and that indigenous seed from this region should be planted in preference to imported seed.

2868 Mogren, E. W.
A study of some aspects of susceptibility of ponderosa pine to attack by Black Hills beetle.
Diss. Abstr. 1955 : **15** : Publ. 12,625 : p. 1477. (Abst.).

Investigations at the University of Michigan have revealed the occurrence of individuals of *Pinus ponderosa* possessing true resistance to *Dendroctonus ponderosae*, this resistance being associated with vigour and a high number of resin ducts.

VEGETABLES

2869 Hahn, P.
Neue Gemüsesorten und ihre Anbaueigenschaften. (**New vegetable varieties and their agronomic characteristics**).
Dtsch. Gartenbau 1955 : **2** : 329–30.

The celeriac variety Dresdener Markt [Dresden Market] is characterized by its bright, stiff, semi-erect leaves and comparative resistance to *Septoria apii*. It gives high yields of good quality roots of a uniform shape and with satisfactory keeping properties. The new carrot variety Koralle [Coral] is a selection from Pariser Markt [Paris Market] and was developed at the Quedlinburg Plant Breeding Institute, Germany. It resembles Pariser Markt in most respects but is more attractive in appearance and has a longer root. It also possesses higher carotene, vitamin and dry-matter contents. The radishes Voran [Onwards] and Feuerkugel [Fire Ball] both originated at the Quedlinburg

Plant Breeding Institute. The former is an early-maturing variety suitable for forcing. Its roots are bright red to scarlet, round, medium large and somewhat shorter than those of Saxa Treib [Saxa Forcing], which it excels in quality. Feuerkugel is similar to Riesen Butter [Giant Butter] in appearance but its roots do not tend to become spongy, when fully grown, as is the case with Riesen Butter.

2870 PHILIPP, F.
Ergebnisse der Gemüsesortenversuche (Im Rahmen der österreichischen Zuchtbuchkommission). [**Results of trials of vegetable varieties (In connexion with the commission for the Austrian book of cultivated varieties)**].
Mitt. Klosterneuburg 1955 : **5** : Ser. B. : 285–319.

The results of trials of new varieties of French bean, onion and parsley and of trials of radish, lettuce and cucumber varieties suitable for early cultivation under glass are presented.

2871 GOETSCH, W.
Die Sortenfrage bei der Frühgemüseproduktion. (**The variety question in the production of early vegetables**).
Dtsch. Gartenbau 1955 : **2** : 295–97.

Varieties of cabbage, cauliflower, kohl rabi, carrot, parsley, radish, onion, lettuce, cucumber and tomato recommended for forcing under glass are listed.

2872 ALEKSANDROV, S. V., VOLKOV, V. JA. & PESTOVA, L. A.
(**Methods of increasing the vitality of cucumbers and tomatoes in hothouses**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 182–92. [Russian].

Seed of several cucumber varieties reproduced in the open gave rise to plants which exceeded those from seed reproduced under glass by 13–17% in yield and by 6–10% in earliness; similar differences were observed in tomatoes and a system of seed production is proposed in which seed of hothouse varieties is multiplied in collective farms in the southern states of the Soviet Union.

Plants of the cucumber Leningradskiĭ Tepličnyĭ 23 [Leningrad Hothouse 23] from seed grown under glass in Leningrad, when crossed with plants of the same variety produced from seed grown in the open at Maĭkop, gave rise to plants which yielded 38·5% more than those arising from self pollination and 21% more than those arising from cross pollination. Slightly smaller increases were obtained by crossing plants from seed raised in the greenhouse at Leningrad with those from seed raised in the open at Hibiny in the far north. Higher yield and earlier bearing resulted also from pollination with a mixture of self pollen and tomato pollen. In tomatoes, increases in yield of up to 16·5% were obtained by crossing plants from seed raised in the open in Leningrad with those from seed raised in the arid Aral area; the fruits were also larger and better in quality and more of them ripened early.

Plants raised from large seed yielded more than those from smaller seeds and figures are presented showing the beneficial effect of various other treatments such as alternations of high and low temperature or soaking in solutions of soda, succinic acid, etc. Seeds from fruits in the terminal inflorescences gave better seedlings than those from fruits towards the base. Hybrid seed from certain varietal combinations gave rise to seedlings which ripened earlier and yielded 17–43% more fruits than those from uncrossed seed. Yield increases also resulted from adding pollen of *Lycopersicon hirsutum*, *L. peruvianum* or *Cyphomandra betacea* to the tomato pollen in producing hybrid seed of tomatoes.

2873 HAYASE, H.
(**The temperature before and after flowering and the germinability of the pollen in cucumbers and egg plants**).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1955 : **24** : 143–48. [Japanese].

Percentage germination of the pollen was examined after subjecting cucumbers and egg plants to various temperatures before and after anthesis. The pollen matures before anthesis in cucumbers but afterwards in the egg plant. In general, high temperatures tend to lower the percentage germination of the pollen and reduce its longevity.

2874 MÜLLER, N.
Gemüsesaatgut - Importüberprüfung 1954/55. (**Vegetable seed. Import investigation, 1954-55**).
Mitt. Klosterneuburg 1955 : **5** : Ser. B. : 320–36; and 1956 : **6** : Ser. B. : 15–22.

The results of trials of seed of radish, carrot, lettuce, spinach, cabbage, cauliflower, kohl rabi, pea, French bean, cucumber, gherkin, green pepper, tomato, onion and shallot varieties imported into Austria during 1954–55 are presented. The trials were concerned with determining which varieties of the above crops were best suited for cultivation in Austria, with ascertaining comparative yielding ability and quality and with obtaining information on varietal purity and extent to which the varieties examined bred true.

2875 WEIBULL, G.
The cold storage of vegetable seed—further studies.
Agri hort. genet., Landskrona 1955 : **13** : 121–42.

In this paper read at the 14th International Horticultural Congress, 1955, it is shown that a storage temperature of −20° C., although more suitable than higher temperatures for many of the vegetable and flower seeds tested at the Weibullsholm Plant Breeding Institute, Landskrona, Sweden, cannot be used for all seed material (cf. *PBA*, XXIV, Abst. 1386); preliminary tests are therefore advocated for any seed with unknown reactions to cold storage.

2876 REINHOLD, J. & GOETSCH, W.
Die Bestimmung der Sortierung und der Zeitigkeit in gärtnerischen Ertragsversuchen. (**The determination of grade and seasonal value in yield trials of vegetables**).
Züchter 1956 : **26** : 27–33.

The formula $G_t = E_n \times Zwz \times \frac{Swz}{100}$ is proposed for estimating the financial yield G_t of a vegetable variety; E_n represents the actual yield, Zwz is an index of the capability of the variety to yield out of season, either early or late, when higher prices are commanded, and Swz is an index of the frequency of products in the higher shop grades.

Early yielding capacity (Fzz) can be expressed in the form $Fzz = \Sigma \frac{(t.e_t)}{\Sigma e}$, where t represents the number of days between planting and any particular yield period, e_t is the yield in the period and e is the total yield.

2877 SEČKAREV, B. I.
(**Classification of the cultivated carrot**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 51–63. [Russian].

The previous systems of classification of the carrots are outlined and those of them which separate cultivated and wild species are criticized, the main grounds being their interfertility, experiments in which wild carrots grown in cultivation acquired the characteristics of cultivated carrots and the existence of a number of intermediate forms. A new classification is presented in which cultivated and wild carrots are placed in a single species, which is divided into two subspecies ssp. *orientalis* and ssp. *occidentalis*, both of which are supposed to have arisen from a common ancestor, probably in the near East, where the greatest diversity of forms exists. Cultivated carrots have, it is believed, arisen polyphyletically from wild forms of both the oriental and occidental groups; hybridization with other species of the genus *Daucus* may also have occurred, *D. maximus* for instance in the Mediterranean area. In this way five main regional groups have arisen and are classified as vars. *asiaticus*, *mediterraneus*, *cilicicus*, *syriacus* and *japonicus* respectively.
Differences in the composition of the pigments between the varieties run parallel to differences between the geographical groups of wild carrots.

2878 ŠILOVA, S. N.
(**Floral biology of radishes**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 169–75. [Russian].

Information is given on floral structure and development, viability of pollen and pistil, conditions of pollination and the degree of self sterility in *Raphanus sativus*, *R. raphanistrum* and *R. maritimus*. Radishes of the Indian, Japanese and Palestine groups set no seed at all when bagged and very few when artificially pollinated with pollen from the same plant; the set in other forms varied from 2 to 50%. Plants produced from selfing invariably showed loss of vigour.

All forms of cultivated radish crossed freely among themselves and also with *R. maritimus* and *R. raphanistrum*; hence strict spatial isolation is necessary for seed production, the distances recommended being a minimum of 2000 m. in open ground and 800 m. in plots protected by woodland. Pollination is effected both by wind and by insects and the most efficient method of bagging was with parchment bags.

No hybrids were obtained in attempted crosses of *R. sativus* with *Brassica oleracea*, *B. napus* or *B. campestris*.

2879 KNOBLAUCH, F.
Stammeforsøg med kepaløg 1952–54. (**Strain trials of onions, 1952-54**).
Tidsskr. Planteavl 1955 : **59** : 601–17.
KNOBLAUCH, F.
Stammeforsøg med kepaløg 1952–54. (**Strain trials of onions, 1952-54**).
Ibid. 1955 : **59** : 717–20.

As a result of trials carried out at four stations in Denmark, three Danish strains of Rijnsburg, two of Zittauer Yellow and one each of Perijka, English Giant and Bronze Ball have received state recognition.

2880 Kononkov, P. F.
(The nature of segregation in hybrid plants).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 182–205. [Russian].

An extended account of a previous report dealing with the segregation of sexual hybrids and progenies of aerial bulbs of onion is presented (cf. *PBA*, XXIV, Abst. 686).

2881 Kazakova, A. A.
(Biological characteristics of local vegetatively reproduced onions).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 162–68. [Russian].

Experiments at the Institute of Plant Industry at Leningrad have shown that the degree of bolting in onion varieties is influenced by the temperature at which the bulbs are stored, high temperatures reducing the amount of bolting and augmenting the number of bulbs. There are hence no grounds for separating the shallots as a distinct species *Allium ascalonicum* and all forms are included in the species *A. cepa*.

2882 Savčenko, N. A.
(Selective fertilization in onions grown for bulbs).
Agrobiologija (Agrobiology) 1955 : No. 6 : 141–43. [Russian].

At Vorošilovgrad, Johnson produced appreciably more seed if it was open pollinated or fertilized by pollen from many inflorescences of the same variety than from a single inflorescence. The seed was larger and of better quality. Varieties with yellow scales, such as Zittau, Johnson and Markovskiĭ gave 29·3%, 7·6% and 1·0% hybrid progeny respectively when interplanted between rows of the variety Red Butterfly with mauve scales. Markovskiĭ, which showed marked preference for self pollen, is an adapted local variety.

2883 Ownbey, M. & Aase, H. C.
Cytotaxonomic studies in *Allium*. I. The *Allium canadense* alliance.
Res. Stud. St. Coll. Wash. 1955 : **23** : No. 4 : Monograph suppl. 1 : Pp. 106.

The *A. canadense* alliance in North America comprises ten species of which *A. canadense* includes six varieties and *A. perdulce* and *A. geyeri* two each. Most species are diploid but some contain both diploid and one or more polyploid races, the basic chromosome number being $x = 7$. The distribution and interrelationships of the groups are discussed.

2884 Kazakova, A. A.
(Form development in garlic).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 144–46. [Russian].

Observation of a collection of forms grown under different ecological conditions showed that those which normally develop inflorescences tend not to do so when grown in northern localities such as Leningrad. The reverse phenomenon has been observed too, forms which normally do not bolt having done so when grown under unfavourable conditions. No grounds are therefore recognized for establishing two subspecies of *Allium sativum* for the bolting and nonbolting forms respectively.

2885 Kurita, M.
Chromosome studies of several *Allium*-plants.
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 206–10.

Descriptions of the caryotypes of six species are given. The caryotype formulae are as follows: *A. bouddhae* f. *giganteum*, $K = 16 = 14V + 2J^T$; *A. togashii*, $K = 16 = 10V + 4J_1 + 2J_2{}^t$; *A. schoenoprasum* var. *foliosum*, $K = 16 = 14V + 2J^t$; *A. monanthum*, $K = 32 = 22V + 5J_1 + 2J_2 + 3J_2{}^t$; *A. porrum*, $K = 32 = 24V_1 + V_2 + 3V_2{}^{cs} + J + 3J^{cs}$; and *A. pseudo-japonicum*, $K = 32 = 30V + 2J^t$.

2886 Krickl, M.
Ist Adventkohlzüchtung notwendig? **(Is the breeding of Advent cabbage necessary ?)**
Saatgutwirtschaft 1956 : **8** : 39–41, 71–72.

It is suggested that early-maturing spring cabbage varieties be selected for winter hardiness, resistance to bolting and early heading to enable strains thus improved to be planted out in the autumn and harvested the following year, so removing the need for early spring forcing. Preliminary research along these lines at the Schönbrunn Horticultural Research Institute, Vienna, has given encouraging results, especially in the case of the varieties Eisenkopf [Iron Head] and Wiener frühes mittelgrosses Nr.2 [Viennese Early Medium-large 2].

2887 Yarnell, S. H.
Cytogenetics of the vegetable crops. II. Crucifers.
Bot. Rev. 1956 : **22** : 81–166.

The author gives a comprehensive review of literature on the cytogenetics of *Brassica* spp., interspecific crosses in *Brassica, Eruca sativa, Raphanus sativus, Raphanus-Brassica* hybrids, *Crambe maritima, Lepidium sativum, Armoracia lapathifolia* and *Nasturtium officinale* (cf. *PBA*, XXIV, Abst. 3400).

2888 Hahn, P.
Neue Gemüsesorten und ihre Anbaueigenschaften. 2. Rotkohl. (**New vegetable varieties and their agronomic characteristics. 2. Red cabbage**).
Dtsch. Gartenbau 1955 : **2** : 44–45.

Two new varieties recently bred in Germany are described. Früher Steinfest [Early Stone-firm] matures earlier than any other red cabbage at present grown in Germany. It has a short stalk and produces a medium-large, round head surrounded by a large number of small, smooth leaves. It is hardy, forms a firm head and gives relatively high yields under soil and climatic conditions usually unfavourable to the cultivation of cabbages. Its smooth outer leaves are not attacked by aphids as readily as the leaves of most other varieties. Granat [Garnet], developed at the Quedlinburg Plant Breeding Institute, is a midlate variety with good keeping properties and produces heavy yields of large, well-formed heads. The outer leaves are large, semierect and dark red to brownish red.

2889 Shibata, K.
(**Self and cross incompatibility in autotetraploid *Brassica pekinensis*. I. Primary and secondary crosses of individuals completely homozygous for the relevant oppositional genes**).
Idengaku Zasshi/Jap. J. Genet. 1955 : **30** : 211–17. [Japanese].

Compatibility relations were ascertained between tetraploid types ($S_aS_aS_aS_a$ or $S_aS_aS_bS_b$) of four homozygous diploid strains (S_1, S_2, S_3 and S_4) of the variety Kanazawa. The results are as follows: $S_aS_aS_aS_a$ x $S_aS_aS_aS_a$, incompatible; $S_aS_aS_aS_a$ x $S_bS_bS_bS_b$, compatible; $S_aS_aS_bS_b$ x $S_aS_aS_bS_b$, incompatible; $S_aS_aS_bS_b$ ♀ x $S_aS_aS_aS_a$ ♂, incompatible, reciprocal compatible; and $S_aS_aS_bS_b$ x $S_cS_cS_cS_c$, $S_aS_aS_bS_b$ x $S_aS_aS_cS_c$ and $S_aS_aS_bS_b$ x $S_cS_cS_dS_d$, compatible.

2890 **New yellows-resistant cabbage named Badger Ballhead.**
Seed World 1956 : **78** : No. **3** : p. 16.

Developed at the Wisconsin Agricultural Experiment Station from Wisconsin Ballhead x Wisconsin Hollander, the cabbage Badger Ballhead combines resistance to yellows and mosaic with good market type.

2891 Lukovnikova, G. A.
(**Biochemical variation in cauliflower**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 193–200. [Russian].

Data on contents of dry matter, sugars and vitamin C show late varieties such as those of Italian origin to have the highest values though they are somewhat lower in yield than midearly sorts. The cauliflowers of the Moscow region are the earliest. The data show the influence of various ecological and cultural conditions upon the composition and yield of the heads.

2892 Anstey, T. H.
Inheritance of white petal in green sprouting broccoli.
Canad. J. agric. Sci. 1955 : **35** : 573–78.

It is shown that the white petals found in a natural mutant of Medium are determined by a single dominant factor *W* which is independent of and epistatic to the factor *cr* governing the development of cream petals. *W* is linked with the gene *gl* for glossy foliage, with a linkage value of 25·32 ± 2·69%.

2893 Kumazawa, S. & Abe, S.
(**The classification of mustard varieties**).
Kyushu Nogyo Shikenjo Iho/Bull.. Kyushu agric. Exp. Sta. 1951 : **1** : 35–38 [Japanese].
Kumazawa, S. & Abe, S.
(**Studies on mustard varieties**).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1955 : **24** : 69–84. [Japanese].

A classification of varieties of *Brassica juncea* grown in the Far East, in particular in Japan, is presented. The following eight major groups are proposed: (1) brown mustard, used for oil, (2) tuberous-rooted mustard, (3) the central Chinese curled mustards, (4) narrow-leaved mustards, (5) the common curled mustards, (6) broad-leaved mustards, (7) cabbage-leaved mustards and (8) the Chinese tuberous-stemmed mustards.

2894 Wittwer, S. H.
Tendergreen—a new leaf lettuce for greenhouse forcing and early outdoor plantings.
Quart. Bull. Mich. agric. Exp. Sta. 1955 : **38** : 67–69.
New lettuce developed by MSU horticulturist.
Sth. Seedsman 1955 : **18** : No. 11 : p. 85.

In type Tendergreen is intermediate between its two parents Bibb and Grand Rapido. Its upright growth habit reduces loss of the lower leaves in harvesting and subsequent handling. Under long-day conditions and at temperatures above 60° F. it readily bolts.

2895 HELM, J.
Über den Typus der Art *Lactuca sativa* L. und deren wichtigste morphologische Gruppen. (**On the type of the species *L. sativa* L. and its most important morphological groups**).
Kulturpflanze, Berlin 1955 : **3** : 39–49.

The morphology and ontogeny of the principal forms of *L. sativa* are outlined briefly and a history of the systematics of the species is given with special reference to Linnaeus's treatment.

2896 BATEMAN, A. J.
Note on dioecy in the Cruciferae.
Heredity 1955 : **9** : p. 415.

It is noted that the predominantly inbreeding genus *Lepidium* contains a single diecious species, *L. sisymbrioides*. This may represent the secondary evolution of outbreeding from inbreeding ancestors; alternatively, the sex-determining factor may have arisen directly from the *S* gene, through selective pressure in an isolated population with too few *S* alleles to function satisfactorily.

2897 SOLOMON, D.
(**About the melon variety "Ananas-77"**).
Sadeh (Field)/Hassadeh 1955 : **35** : 697–98. [Hebrew].

Several varieties of melons were compared in Israel without irrigation. Two selections from local Arab material, Ananas-77 and Ananas-Yoknam, were the best in yield and quality. They yielded 13·3 and 12·0 tons per ha. respectively. The fruit of both is spherical, weighs 3–4 kg., and has a sweet and delicate flavour with a pleasant pineapple-like aroma.

2898 KHOSHOO, T. N.
Cytotaxonomy of Indian species of *Citrullus*.
Curr. Sci. 1955 : **24** : 377–78.

The F_1 plants from *C. vulgaris* x *C. colocynthis* and the reciprocal cross showed marked heterosis and matroclinal inheritance. A chromosome number of $2n = 22$ was observed in both parents and in the hybrids, which had 30–40% pollen fertility and about 35% seed fertility. A number of hybrids combined the useful characters of both parents. Attempts to cross either of the two parents with *C. vulgaris* var. *fistulosus*, which has $2n = 24$, not $n = 11$ as reported by Naithani and Das (cf. *PBA*, XVIII, Abst. 538), were unsuccessful.

2899 WATTS, V. M.
Whitehope melons.
Arkans. Fm. Res. 1955 : **4** : No. **4** : p. 8.

Developed at the Arkansas Agricultural Experiment Station, the water melon Whitehope is early maturing and *Fusarium*-wilt resistant, with high quality. Its parentage involves Hawkesbury, Stone Mountain 5, Kleckly 6 and Tom Watson.

2900 GREBENŠČIKOV, I.
Notulae cucurbitologicae II. Über *Cucurbita texana* A. Gr. und ihre Kreuzung mit einer hochgezüchteten *C. pepo*-Form. (**Notes on *Cucurbita*. II. On *C. texana* A. Gr. and its hybridization with an élite form of *C. pepo***).
Kulturpflanze, Berlin 1955 : **3** : 50–59.

Morphological studies of *C. texana*, a wild form of Texan origin, and the results of crosses between *C. pepo* conv. *giromontiina* 'Zucchini Squash' ♀ and *C. texana* ♂ suggested that *C. texana* should be classified as a botanical variety of *C. pepo* and may even be the primitive ancestor of cultivated forms of this latter species. Crosses between the two forms were 100% fertile, whereas crosses of either type with *C. moschata* or *C. maxima* or of *C. moschata* with *C. maxima* gave considerably lower fruit sets (cf. *PBA*, XXV, Abst. 2469). Some of the characters of the cultivated variety, i.e. short vines, early maturity and comparatively small number of fruits per plant, proved dominant and were polygenically determined. The bitterness of the flesh of the wild form was dominant over the lack of bitterness of the cultivated variety and was due to a single gene, designated *Bi* (cf. *PBA*, XXV, Abst. 2465). The following characters were polygenically determined and were intermediate in inheritance: weight, length and length/breadth ratio of the fruit; number of seeds per fruit; and ratio between weight of dry seeds and weight of the fresh fruit.

2901 SCHAGEN, R.
Embryologische Untersuchungen am Feigenblattkürbis (*Cucurbita ficifolia* Bouché) nach Bestäubung mit Pollen des Gartenkürbis (*C. pepo* L.). (**Embryological investigations of *C. ficifolia* Bouché after pollination with pollen of *C. pepo* L.**).
Flora, Jena 1956 : **143** : 91–126.

Pollen of *C. pepo* germinated normally on the stigmas of *C. ficifolia*, a species possessing a high degree of resistance to frost and various diseases, but pollen-tube growth was inhibited in the styles and ovaries with the result that only 24% of the ovules were fertilized. In 98% of cases the ovaries died shortly after fertilization. Embryos were formed in the ovaries that survived but endosperm growth was defective and no viable seeds were obtained.

2902 WEILING, F.
Die Übertragung des Merkmals "Weichschaligkeit" vom Ölkürbis (*Cucurbita pepo* L.) in fertile Artbastarde aus der Kreuzung *Cucurbita maxima* Duch. x *Cucurbita pepo* L. [**The transference of the character "soft shell" of the oil pumpkin (*C. pepo* L.) to fertile interspecific hybrids from the cross *C. maxima* Duch. x *C. pepo* L.**].
Züchter 1956 : **26** : 22–25.

Some F_4 plants of a cross effected at the Institute of Agricultural Botany, Bonn University, between *C. maxima* ♀ and *C. pepo* 'Schreiber's Ölkürbis' [Schreiber's Oil pumpkin] ♂ were found to have seeds with the soft shell of the *C. pepo* parent. The F_4 plants were obtained by back crossing the original hybrid twice with *C. maxima* and selfing it in the F_3. Fertility was low in the F_3 but improved in the F_4. The F_4 plants, which were morphologically similar to the *C. maxima* parent, produced a marked preponderance of ♀ flowers. The average number of viable seeds per fruit was low.

2903 SHIFRISS, O.
Genetics and origin of the bicolor gourds.
J. Hered. 1955 : **46** : 213–22.

By means of selection and inbreeding in normal bicolour gourds, which tend to be genetically and phenotypically unstable, it has been possible to develop stable races with almost entirely yellow fruits. Fruit colour in such races develops before anthesis and is determined by a dominant gene *B* inherited independently of the other pigment controlling genes, *L*, *W* and *Y*. The heterozygote *Bb* may resemble the dominant homozygote or it may be extremely variable, depending on the rest of the genotype. It is suggested that the bicolour character originated as a mutant of *Cucurbita texana*, a species to which most ornamental gourds are closely related.

2904 MILOVANOVA, L. V. & FILOV, A. I.
(**Gourds as a source of carotene**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 201–21. [Russian].

The fruits of certain forms of *Cucurbita moschata* from Mexico and South America contain over 200 mg. of carotene per 100 g. dry weight. In *C. maxima* the highest value was 135·4 mg. per 100 g. and other species such as *C. pepo*, *C. ficifolia* and *C. texana* had much lower values. The advantages of cucurbits as a source of carotene are pointed out and the varieties thought to be of most interest in this respect are described and illustrated; they include two gourds selected specially for high carotene content, namely Vitaminnaja [Vitaminiferous] and Karotinnaja 102 [High-carotene 102].

2905 POPOVICH, M., DEVCIC, J. & CASTRONOVO, A.
Efectos de la competencia en los ensayos comparativos con zapallitos de tronco. (**Effects of competition in comparative tests of bush gourds**).
Rev. Invest. agríc. B. Aires 1955 : **9** : 373–78.

In the course of breeding work with bush forms of *Cucurbita pepo* and *C. maxima*, experiments were made to determine the best layout for comparative field tests of selected lines. The results show that a spacing of 0·80 m. x 1·20 m. is the best; under these conditions the competition is so great in *C. maxima* that no correction for missing plants is necessary; in *C. pepo* the correction can be made by the accepted statistical procedures.

2906 ALEKSANDROV, S. V. & BOOS, G. V.
(**Methods of breeding forcing cucumbers**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 243–62. [Russian].

Descriptions are given of the cucumber varieties at present used for forcing in the USSR, with indications of their origin and main merits and defects. During the period 1948–53 observations were made on some 600 varieties in greenhouses and hot frames and the best of them were subjected to selection, by which means several varieties distinguished by large fruits, high yield under glass and good flavour and quality have been selected; most of them have short lateral shoots which do not need frequent pinching out; some form fruits parthenocarpically. The varieties are described. Klinskiĭ 1545 was selected from a local cucumber of the Voronež province; it ripens late, gives a high yield of fruits weighing 110–130 g., is resistant to most fungous diseases and tolerant of intense sunlight. Klinskiĭ 2137 is a selection with long fruits weighing 110 g., is late, yields well and is resistant to diseases. Maĭkopskiĭ Parnikovyĭ 1993 [Maĭkop Hot-frame 1993] is a hybrid of Klinskiĭ x Indian, bears fruits weighing 130–180 g., is late, yields well but is less disease resistant than Klinskiĭ. Leningradskiĭ Tepličnyĭ 23 [Lengingrad Hothouse 23] bears fruits weighing up to 200 g., yields up to 20 kg. per sq. m., ripens somewhat earlier than Klinskiĭ, is resistant to bacterial infection and is suitable for keeping and preserving. Dlinnoplodnyĭ 1294 [Long-fruited 1294] bears fruits up to 54 cm. in length weighing up to 300 g., is somewhat later than Klinskiĭ, yields up to 26 kg. per sq. m. and is suitable for salting; its disease resistance is average. Vostočnyĭ 571 [Oriental 571] is slightly earlier than Klinskiĭ, yields up to 23·4 kg. sq. m. and is average in disease resistance. Lučšiĭ iz Vzeh 161 [Best of All 161] bears fruits weighing over 200 g., ripening a week before Klinskiĭ, yields up to 25·9 kg. per sq. m. and is moderately resistant to diseases. Vygonočnyĭ 159 [Forcing 159] is 2–6 days earlier than Klinskiĭ, bears fruits weighing over 200 g., yields up to 23·3 kg. per sq. m. and is moderately disease resistant. Nesravnennyĭ 1295–a [Incomparable 1295–a] is distinguished by fruits of very excellent flavour weighing over 300 g., ripens late and yields up to 22 kg. per sq. m. Virovskiĭ Salatnyĭ 1295–b [Virov Salad 1295–b] resembles the foregoing but is greener in colour. Osennyĭ 60 [Autumn 60] starts to bear a day or two before Klinskiĭ or at the same time but continues longer, yielding up to 23 kg. per sq. m.; it is moderately disease resistant. Urožaĭnyĭ 1596 [High-yielding 1596] is a late variety yielding up to 23·4 kg. per sq. m. and moderately disease resistant. Unicum 121 has fruits over 200 g. in weight and an average yield of 17 kg. per sq. m. Tepličnyĭ 2051 [Hothouse 2051] is a late variety with fruits weighing 300 g., yields up to 20 kg. per sq. m. and is resistant to blotch, mildew and many other diseases.

In yield tests most of these varieties have exceeded the standard, Klinskiĭ, and Leningradskiĭ Tepličnyĭ has outyielded it by over 43%. Certain other varieties are described as being suitable for hot frames.

Increased yield and earliness have been attained by what is referred to as the Mičurin method of using hybrid seed; the excess of yield over the standard Klinskiĭ varied from 22·4 to 76·8%, the best combination being A. J. Filov's hybrid x Mnogoplodnyĭ 564 [Many-fruited 564]. Crosses in which a forcing variety was pollinated by an outdoor variety gave the best results.

2907 Avdeev, I. T.
(Hardy hybrids of cucumber and tomato).
Dostižen. Nauk. pered. Opyt. seljsk. Hozjaĭstv. (Achiev. Sci. progr. Exp. Agric.) 1955 : No. 12 : 40–41. [Russian].

New varieties of cucumber which ripen a fortnight earlier than Nežin and withstand spring frost of —4° C. have been obtained by grafting the cucumber variety Borčšagovskiĭ on stocks of the melon Kolhoznica [Collective Farmer] and the water melon Ljubimec Hutora Pjatigorska [Favourite of Pjatigorsk Farm]. The first seed generations were hardened by early sowing. The graft hybrid cucumber/water melon is the more productive of the two, the yield being 300 c. per ha. Reference is made to experiments on grafting tomatoes on *Caragana frutescens*. The first generations of these hybrids were notable for earliness.

2908 Rybka, N. M.
(The new tomato variety Kolhoz 34).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 2 : 18–19. [Russian].

Kolhoz 34 (194/118 x Opolčenec 534 [Serviceman 534]) from the Canning Institute is characterized by high yield, earliness and large smooth red fruits. The first fruits ripen 2–6 days after Majak 12/20–4 [Lighthouse 12/20–4] but the yield is more uniform and it outyields this variety by a good margin.

2909 Klepač, A. G.
(High yields of tomatoes grown in the greenhouse in the Far North).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 1 : 30–33. [Russian].

In recent trials in the Komi ASSR, the variety Altaĭ surpassed all others in yield, particularly in yield of first fruits. Biĭskiĭ Želtyĭ [Yellow Biĭsk] and Break o' Day took the second and third places.

2910 Andeweg, J. M. & Ruyten, J. H.
Praktijkproeven tomaten 1954–1955.
(Field trials of tomatoes, 1954-55).
Meded. Dir. Tuinb. 1956 : **19** : 170–78.

Data are presented on the yield, earliness, quality and shape of the fruit and average fruit weight of 54 selections tested in unheated greenhouses at Wageningen and elsewhere in the Netherlands in 1954–55. Selections of Ailsa Craig and Moneymaker gave the best all-round performances; the hybrids Gouden Ster [Golden Star], Unic and Grower's Pride were distinguished by their early maturity. The sources from which seed of the approved selections may be obtained are indicated.

2911 Powers, L.
Components of variance method and partitioning method of genetic analysis applied to weight per fruit of tomato hybrid and parental populations.
Tech. Bull. US Dep. Agric. 1955 : No. 1131 : Pp. 64.

A biometrical study of the genetics of locule number and locule weight in the P_1, P_2, F_1, F_2 and back-cross generations of Criolle x Sioux is presented. The experimental design adopted was a modified randomized complete block. The analyses used were analysis of means, partitioning of the variances and covariances, and estimation of the number of effective factors. The effective genotype of Criolle is *AAbbccddee*, and conversely for Sioux. Loci *AB* affect locule number and *BCDE* control locule weight. Interallelic and epistatic interactions were detected. A method of discriminating between isodirectional and nonisodirectional operation of effective factor pairs is described. Modifiers affected genetics of locule number.

2912 Korneev, A. P.
(**The new tomato variety Spartak**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1955 : No. 12 : 28–29. [Russian].

Spartak (Korneevskiĭ x Majak [Lighthouse]), bred recently in the Penza province, is tolerant of frost and moderate in external requirements. The plants are vigorous and produce up to 10 kg. of fruit each. The fruits are red, large, with few seeds and have firm flesh of good flavour.

2913 Rick, C. M., Baughn, C. G. & Hall, B. J.
Three new hybrid tomatoes.
Calif. Agric. 1956 : **10** : No. 1 : 4–5, 10.

The F_1 hybrids Hybrid 2 [♂ sterile Pearson (ms_2) x LA211], Hybrid 8 [♂ sterile Ace (ms_{17}) x LA211] and Hybrid 11 [♂ sterile Ace (ms_{17}) x Earlypak], developed at the University of California, give high early yields of fruits with good quality. The first two hybrids have a compact, determinate habit and are only suitable for covered cultivation without staking and possibly also for domestic gardens. H11 can be staked and is the most widely adapted of the hybrids.

2914 Bálint, A.
A heterozis elmélete, jelentősége és eredményei a paradicsomnemesítésben. (**The theory, importance and results of heterosis in tomato breeding**).
Agrártud. Egy. kert- szőlőTud. Kar Évkön. 1951 : **2** : 239–69.

The results of interspecific and intervarietal crosses effected at the State Plant Breeding Institute, Hungary, during 1947–48 are reported. Heterosis was observed in both types of hybrid, the F_1 generation showing an average increase in yield of 25·6–93·3% over the higher-yielding parent and 36% of the F_2 showing an increase of 37·74%. Hybrid vigour was most marked in interspecific hybrids but significant heterotic effects were also found in intervarietal and occasionally in intravarietal hybrids. The results are interpreted along Mičurinist lines.

2915 Marinkov, E.
(**Studying heterosis in tomatoes in connexion with possibilities for selection at early stages of development**).
Naučn. Trud. Selskostopan. Akad. Georgi Dimitrov Agronom. Fak. (Sci. Trans. G. Dimitrov Agric. Acad. Agron. Fac.) 1952 : **1** : 43–56. [Bulgarian].

At the Dimitrov Agricultural Academy the productiveness and earliness of some hybrids has been analysed and data showing average yield of fruit per plant, average weight of fruit and earliness for each hybrid and each parent variety are presented. The data showing average yields include separate values for ripe and immature fruits. In hybrids Zarja [Dawn] x Komet [Comet] and Kurtovski x Komet heterosis occurred only in respect of earliness. Hybrids 10 x Bison and Plovdivska Konserva [Plovdiv Canning] x Bison combined the earliness of Bison and the high yield of 10 or Plovdivska Konserva respectively and bore fruits of intermediate size. A method of selection, based on the rate of germination of the F_1 and F_2 seed in a 5% sugar solution, has been developed. Plants raised from the seed characterized by a high germination rate were early types. Lysenko's advice that selection of early forms should begin in the F_1 is borne out by these experiments.

2916 Brežnev, D. D. & Batygina, T. B.
(**Methods of overcoming the incompatibility of the cultivated tomato, *L. esculentum*, with the wild species *L. hirsutum* and *L. peruvianum***).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 125–35. [Russian].

In pollinations of cultivated tomato varieties with *Lycopersicon peruvianum* the number of fruits set was increased from 8·3% to 53·9% by repeating the pollination twice; good sets of fruit were obtained by pollinating the flowers 7–8 days after emasculation and by using a mixture of pollen of *L. hirsutum* and *L. peru-*

vianum, the latter method giving a good set of seeds too.

Pollinations of *L. esculentum* by *L. hirsutum* were more successful in conditions of high humidity; again the best fruit sets were obtained by mixing the pollen of *L. hirsutum* with pollen of *L. peruvianum*, or some other Solanaceous species, and by repeated pollination; the best seed sets were from repeated pollinations and from mixed pollen of *L. hirsutum* and other Solanaceous species.

No improvement in set was observed when hybrids rather than pure varieties served as maternal parents.

2917 Young, P. A.
Curl, a mutant teratism of the tomato.
J. Hered. 1955 : **46** : 243–44.

A bud mutation arising in a Stokesdale plant produced a branch with small tightly-curled leaves and short rosette-like side branches. Crosses between seedlings bearing the curled-leaf character and Rutgers and Marglobe indicated that the character was determined by a single dominant gene designated *Cu*.

2918 Baĭda, H. S.
(**Growing grafted plants in a dark room**).
Agrobiologija (Agrobiology) 1955 : No. 6 : 65–73. [Russian].

Experiments at Alma-Ata in which shoots, buds, flowers and inflorescences of tomatoes were grafted on to potato tubers and the grafted plants were cultured in a dark room, are described. The scions formed better unions with the tubers of Smyslovskiĭ [Fürstenkrone], Rannjaja Roza [Early Rose], Centifolia and Epicure than those of other varieties. Sowing these varieties in summer and storing the harvested tubers at temperatures not exceeding 10° C. also improved their quality as stocks. The fruits produced by the scions resembled the controls externally, but differed from them in some other respects. (1) Some contained $\frac{1}{3}$–$\frac{1}{4}$ of the normal amount of seed, which was variable in shape and in some cases underdeveloped. (2) Some fruits had seedless locules. (3) Others had locules filled with parenchymatous tissue and were seedless or produced only a few underdeveloped seeds. (4) In some cases different parts of a single fruit differed in structure and the seed varied in shape.

In some fruits the seed germinated inside them, the cotyledons then being always green. The flesh of most experimental fruits at the beginning of ripening was high in starch.

Seed progenies of the above material are under observation, as it is hoped that a new economically valuable form of plant might be selected.

2919 Jurcev, V. N.
(**Characteristics of regeneration and phasic development of adventitious buds and shoots of perennial herbaceous and woody plants**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1955 : **32** : No. 1 : 134–71. [Russian].

The course of development of adventitious shoots arising from the callus of decapitated plants of three tomato varieties is described. The majority of them formed inflorescences at the 9th to 10th node, just as seedlings used as controls did, and regardless of the point at which decapitation was performed. This is taken to indicate that the adventitious shoots were phasically young and originated from secondary meristems. From a histological study of the callus it was concluded that the meristem that gave rise to it arose not only from elements of the phloem, cambium and xylem but also from the parenchyma and even collenchyma; mitosis was rarely observed in the cells of this meristem, the nuclei of which divided amitotically by fragmentation into 2, 3, 4 and more parts, which later became surrounded by cell walls; at the point where the adventitious bud developed the cytoplasm became filled with nuclear material and stained with nuclear stains during the stage prior to amitotic division.

Similarities in morphology were observed between adventitious shoots and young seedlings in *Tilia cordata*, *Eucalyptus* spp., *Malus toringo*, *Populus tremula* and the raspberry Marlborough. In leaves cut from mature plants of *Begonia rex* the nuclei disappeared and became diffused throughout the cytoplasm, which then divided by fragmentation as in the tomato callus, giving rise to a secondary meristem from which adventitious shoots or roots arose. Similar phenomena are reported in the developing axillary buds of *Lilium tigrinum*.

2920 Aizenštat, Ja. S. & Volkova, Z. A.
(**Characteristics of the behaviour of the progeny of tomato hybrids after supplementary pollination with pollen of other genera and with immature pollen of the maternal variety**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 136–43. [Russian].

Hybrids of the dwarf variety Planovyĭ [Planned] x 1615 (*Lycopersicon esculentum* var. *cerasiforme*) produced from pollination with large quantities of pollen were intermediate in habit, and had small fruits resembling those of var. *cerasiforme*; the hybrids from pollination with a limited quantity of pollen were similar. When pollen of some other plant such as red pepper or egg plant, or immature pollen of Planovyĭ, was added to the limited quantity of pollen however, some plants were of the maternal type and others intermediate. In crosses of Bison x Višnevidnyĭ Krasnyĭ [Red Cerasiforme], the hybrids from unlimited and limited pollen were intermediate, addition of pollen from the other genera caused the segregation of certain plants resembling var. *cerasiforme* and addition of immature maternal pollen caused segregation into plants of maternal type, plants resembling var. *cerasiforme* and intermediates in some of the families; plants resembling var. *pyriforme* also appeared in several families. In the combination Štambovyĭ Karlik [Determinate Dwarf] x Višnevidnyĭ Krasnyĭ, pollen from other plants had no effect but immature maternal pollen caused segregation into dwarf determinate, tall determinate and intermediate. In the combination Mikado x Višnevidnyĭ Želtyĭ [Yellow Cerasiforme], segregation also occurred only after the addition of immature maternal pollen, some of the segregates differing from both parents in having determinate growth, which also appeared in the combination Štambovyĭ Karlik x Albino after the addition of pollen from other genera.

It is pointed out that the variation resulting from the application of foreign and unripe pollen was greater when it was applied in small quantities than in large.

2921 Burdick, A. B. & Mertens, T. R.
Manifold effects of the gene bi in the tomato.
J. Hered. 1955 : **46** : 267–70.

When one or two of the genes *bi*, *f*, and *lf j* (cf. *PBA*, XXV, Abst. 1495) are in the homozygous state, they determine (1) bifurcation of the inflorescence, (2) fruit fasciation and (3) leafy inflorescence and jointless pedicel, respectively, but when all three are homozygous the resulting plant shows the extreme fasciation described as the rosette type. It is suggested that each gene is associated with the production of a hypothetical substance, fascinin, which, when all three genes are homozygous, is produced in sufficient quantity to induce fasciation in parts of the plant besides those affected when only one or two of the genes are homozygous. Many garden varieties are thought to be of the *bi f* genotype but to carry additional genes for ribless fruits and an inhibitor for *bi*.

2922 Magelli, E.
Il vero San Marzano. (**The true San Marzano**).
Sementi elette 1955 : **1** : No. 2 : 10–16.

The popular Italian tomato San Marzano, characterized by elongated fruits especially suitable for peeling and conserving, is easily confused with a number of other varieties with elongated fruits. Brief descriptions of these are given, to enable them to be distinguished from the true San Marzano, which is described fully, and all are illustrated by photographs of the fruits.

2923 Tarutani, T.
(**Studies on the manufacture of tomato juice. I. On varieties suitable for extracting tomato juice**).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1954 : **6** : 199–204. [Japanese].

Data are provided on the colour, flavour, dry matter content, acidity and ascorbic acid content of a series of Japanese and American varieties. The varieties most suitable for juice extraction are indicated.

2924 Ilan, B.
(**"Tamar"—a new variety of tomatoes for industry**).
Sadeh (Field)/Hassadeh 1955 : **35** : p. 702. [Hebrew].

A new variety of tomatoes, suitable for processing, is announced. The fruit is on the average 6 cm. long and 3 cm. wide, weighs 50 g. and has a dark red colour. It has a 6·0% dry matter content, resists cracking and keeps well. The yield under irrigation is 30–35 tons per ha.

2925 Avila, A. & Castronovo, A.
Nuevos estudios sobre contenido de materia seca en frutos de tomate. (**Further studies on the dry-matter content in tomato fruits**).
Rev. Invest. agríc. B. Aires 1955 : **9** : 219–28.

Further determinations (cf. Abst. 1885) indicate that the refractometric index for the majority of varieties falls between 4·00 and 5·99; only 10 were above 6·00, one of them being a form of *Lycopersicon pimpinellifolium* and the rest wild forms of *L. esculentum* or cultivated forms of *L. esculentum* var. *cerasiforme*, all having small fruits. Differences in values were observed between plants of the same variety and considerable improvement could be effected in many varieties by selection alone. Little variation was observed in values of fruits taken from the first four bunches of any plant but later bunches tended to have higher values and analyses for purposes of selection should therefore be confined to the first four bunches.

On comparing the values in selfed fruits of a given variety with those from fruits on the same plant obtained by cross pollination, significant differences were found, the crossed fruits having in some cases higher dry-matter contents and in others lower; the differences were not positively correlated with the values for the pollen parent but were with those for the seed parent.

2926 Brežnev, D. D.
(Modern classification of the genus *Lycopersicon* Tourn.).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 5–50. [Russian].

The tomato collection of the Institute of Plant Industry in Leningrad has been studied under the varied conditions of the many territories of the Soviet Union, as a result of which the genus has been divided into three species, *L. peruvianum*, *L. hirsutum* and *L. esculentum*, which are described. The species *L. pimpinellifolium* has been reduced to a subspecies of *L. esculentum* and *L. cerasiforme*, *L. pyriforme*, *L. pruniforme* and *L. humboldtii* to botanical varieties. None of the many diseases of the tomato has ever been found on *L. hirsutum*, which is therefore regarded as particularly valuable for breeding disease-resistant tomatoes. *L. esculentum* ssp. *pimpinellifolium* is also regarded as interesting for the same purpose, var. *eupimpinellifolium* for disease resistance, var. *racemigerum* for drought resistance; *L. esculentum* ssp. *subspontaneum* var. *elongatum* is distinguished by immunity from big bud, *Phytophthora* and certain other diseases, and var. *succenturiatum* by resistance to drought and many fungous, bacterial and virus diseases.

The varieties of cultivated tomatoes are arranged in a number of regional groups, the main characteristics of which are described and illustrated.

2927 Brežnev, D. D.
(Using the specific and varietal resources of the tomato in breeding).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.Breed.) 1954 : **31** : No. 1 : 64–94. [Russian].

Some 2500 specimens, including varieties from all over the world and all the territories of the Soviet Union, have been studied in different climatic areas of the USSR, as a result of which certain varieties are recommended for regions with extreme variation between night and day temperatures, for conserving, for extending the season of bearing, for dry matter content and for resistance to low moisture content of air or soil, when grown with and without irrigation respectively. Plants grown under unfavourable conditions without irrigation usually had a shorter period of fruit production and their seed progeny showed the same reduction compared with progenies of plants grown under irrigation; this effect was not shown by certain conservative varieties such as Ponderosa and vars. *pyriforme* and *pruniforme*.

The highest yields on irrigated land were given by Soviet varieties, some of which yielded up to 75 tons of ripe fruits per ha.

Other varieties had the capacity to continue growth and form fruit under northern conditions where night temperatures often fall to 0° or 1° C.

Data are presented on the reaction of the varieties to a number of diseases. Many were resistant to *Macrosporium* and some to mosaic or to *Phytophthora*, the wild species *Lycopersicon hirsutum* and *L. peruvianum* being completely immune to *Phytophthora* and also to *Septoria*.

Certain varieties were selected as being the most suitable for growing in greenhouses and in artificially heated soil; thus Leningradskiĭ Skorospelyĭ [Leningrad Early] ripened before Bison and gave 41% more yield, the fruits being 100 g. in weight and good in flavour. Uraljskiĭ Mnogoplodnyĭ [Ural Many-fruited] yielded 40·9% more than the standard in 1949 and 71% more in 1948 and 1950, it ripens slightly later than Bison but is resistant to leaf spot and the fruits are good in flavour, being borne in bunches of up to 40. Other varieties recommended are Gruntovoĭ Gribovskiĭ [Gribovo Outdoor], which is earlier than Bison, resistant to streak and determinate in habit; Tepličnyĭ Brežneva [Brežnev's Hothouse], a high-yielding variety somewhat later than Bison, having fruits weighing up to 130 g. with a high dry-matter content; and Tepličnyĭ VIR [Institute of Plant Industry Hothouse], resistant to streak and *Phytophthora* and bearing fruits of bright orange-red colour with good flavour. Another group of varieties is recommended as coming into bearing somewhat later and continuing to fruit until November or December; these are Osenniĭ 205 [Autumn 205], with small fruits of very good flavour; Anait, a high-yielding form with large fruits with high content of vitamins; Zarja 1801–b [Dawn 1801–b], a variety with large fruits; and Rozovoplodnyĭ 1642 [Pink-fruited 1642], a form with large pink fruits. All these varieties have fruits with good flavour and high dry-matter content. Other varieties are recommended for growing in hot frames and a further group for cultivation under transparent paper covers.

2928 Hoover, M. M., Alexander, L. J., Paddock, E. F., Crum, R. A. & Dodge, A. F.
Horticultural characters and reaction to two diseases of the *Lycopersicon* accessions in the North Central Region.
Bull. Ohio agric. Exp. Sta. 1955 : No. 765 : Pp. 19.

The results of an evaluation of 1253 accessions with respect to horticultural characters and reaction to tobacco mosaic and the leaf-blight phase of *Alternaria solani* are reported. Approximately three-quarters of this number of accessions consisted of representatives of *L. esculentum*; other species tested were *L. glandulosum*, *L. hirsutum*, *L. peruvianum* and *L. pimpinellifolium*. The 91 genetic stocks studied comprised marker lines, autodiploids, tetraploids and male-sterile and other unfruitful forms. Seed of these accessions has been multiplied and placed in storage at the Regional Plant Introduction Station, Ames, Ia., for distribution to research workers in the USA and other countries.

2929 Ivanova, K. V.
(**Wild species of tomato and their importance for breeding**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 95–124. [Russian].

Descriptions are given of *Lycopersicon hirsutum* and *L. peruvianum*. Hybrids were obtained by grafting the varieties Bison and Tuškinskiĭ on to *L. hirsutum* and pollinating the flowers of the cultivated variety repeatedly with pollen from *L. hirsutum*. The F_1 hybrids were pubescent and when grown in long days resembled *L. hirsutum* in most characters and all flowers were sterile; when grown in a 12-hour day two F_1 plants produced 28 small fruits, only one of which reached maturity, giving 41 seeds, 22 of which were glabrous like those of *L. hirsutum*, 8 resembled those of the cultivated parent and 11 were intermediate. The glabrous seeds germinated well and gave rise to F_2 plants which, when grown in long days, resembled the F_1; in short days the F_2 plants segregated for morphological features and for vigour, over half of them being dwarfs; the remainder exhibited certain characters of the cultivated tomato but some formed no fruits; on the others the fruits were all small, green and mostly pubescent. The wild characters were more predominant still in the F_3; in short days some segregation for disease resistance was observed, whereas in long days all plants were entirely free from *Septoria*, *Macrosporium* and *Phytophthora*.
When the F_1 plants were grafted on to plants of cultivated tomato varieties the scions grew very slowly and mostly died; no fruits were obtained. In the reverse graft, the hybrid serving as rootstock, the scion developed better and 35 of its flowers when pollinated repeatedly with the hybrid gave rise to 18 fruits; from their seeds an F_2 generation was obtained, only some of which segregated in long day, the rest being like the cultivated parent. Several plants in the segregating progenies showed heterosis; some were determinate in growth, others indeterminate; the inflorescences were of the cultivated type but 42 plants out of 99 formed no fruit; in others fruits formed too late to ripen, and only one family produced abundant fruits; this family was varied in morphological features; the fruits were mostly small and smooth, some showed slight signs of pubescence, most of them were yellow or orange coloured when ripe but one plant had fruits with a mauve tinge. This F_2 generation also contained a group of plants resembling the cultivated tomato morphologically, though some of them were sterile.
Attempts at pollination of several varieties of cultivated tomato with *L. peruvianum* failed and even when the cultivated varieties were grafted on to *L. peruvianum* before pollinating ripe fruits were formed but many of the seeds in them were not fully developed; those that germinated gave rise to plants of the maternal type, except that some of them had a higher vitamin C content. One hybrid of intermediate type was obtained in 1953. Pollination of unemasculated flowers of *L. peruvianum* with cultivated tomatoes also gave rise to progeny all of the maternal type.

2930 Meščerov, Ė. T.
(**Improving the varietal quality of tomatoes by growing from seed sown in the open**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 222–26. [Russian].

Plants arising from seed grown in the open ripened at Leningrad some 17 days before those from seed grown in hot frames and gave a higher yield of fruits. The difference is ascribed to their greater cold resistance.

2931 PIMAHOV, F. A.
(The question of heat and drought resistance of vegetables).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1954 : **31** : No. 1 : 180–81. [Russian].

Certain varieties of tomato bore quite successfully in very arid areas in Soviet Central Asia without irrigation, the most tolerant of atmospheric and soil drought being Humbert, Sovremennyĭ [Modern], Sliva Rozovaja [Pink Plum], Lucullus, Danish Export and Jabločnyĭ [Apple].

2932 MENIS, Y.
(Experiments on tomato varieties resistant to *Fusarium*).
Sadeh (Field)/Hassadeh 1955 : **35** : 419–22. [Hebrew].

Tomatoes are frequently attacked by *Fusarium* when grown in the summer in Israel. Marmande, the variety usually grown, is very susceptible. Some resistant varieties were planted experimentally in a *Fusarium*-infested field. The best of these were 51F–19–ML, 51F–63–ML and Hawaii.

2933 BINGEFORS, S. & JÖNSSON, A.
Aktuella sortfrågor inom trindsädesodlingen. **(Current varietal questions in pulse cultivation).**
Allmänna Svenska Utsädesaktiebolaget, Svalöf 1956 : 20–22.

Varieties of cooking and fodder peas, vetches and field beans are recommended for different parts of Sweden. Promising new Svalöf varieties include the early yellow cooking pea U03521, the late fodder peas Bello and U05181 and the field vetch U02281.

2934 KVASNIKOV, B. V. & DOLGIH, S. T.
(The importance of the varietal characteristics of nodule formation in legumes for the succeeding crop).
Agrobiologija (Agrobiology) 1955 : No. 6 : 102–11. [Russian].

At Moscow a number of varieties of peas, *Phaseolus* and *Vicia faba* showed various degrees of symbiosis with the nitrogen-fixing bacteria. The ability of a variety to produce many nodules, which is stated to be a heritable character, is discussed in relation to the growth period and productiveness of the variety and to the yield of the succeeding crop.

2935 ÅKERBERG, E., BINGEFORS, S. & PERSSON, P. J.
Förädlingen av åkerbönor, *Vicia faba* L., vid Sveriges Utsädesförenings Ultunafilial. **(Breeding of field beans, *V. faba* L., at the Ultuna branch of the Swedish Seed Association).**
Sverig. Utsädesfören. Tidskr. 1955 : **65** : 333–56.

Breeding since 1931 is reviewed. Promising strains, including the small-seeded, high-yielding variety Primus, have been produced by selection from Swedish commercial varieties. Of the extensive foreign material under investigation, early Finnish varieties with very small seeds and rather low yields have shown promise in crosses with high-yielding Swedish material, and early-ripening small-seeded strains from Ethiopia, although unadapted to Swedish conditions, are expected to be of value in breeding. Primus and the Finnish land race Pirhonen are undergoing X irradiation. Attempts to select strains resistant to *Aphis fabae* have so far been unsuccessful.

2936 DRAYNER, J. M.
Regulation of outbreeding in field beans (*Vicia faba*).
Nature, Lond. 1956 : **177** : 489–90.

Pollination experiments under glasshouse conditions at the Plant Breeding Institute, Cambridge, England, showed that with inbreeding the ability to set seed without some manipulation of the flower was progressively lost. In the case of the more advanced inbreds, cross pollination was more effective than artificial self pollination, possibly some degree of self incompatibility thus being indicated. On hybridization, spontaneous self fertility was restored. It would therefore appear that, in the field, plants arising from cross fertilization in the previous year will set more selfed seed in the absence of pollination by bees than the remainder of the population. The overall effect of such breeding behaviour is maintenance of the population in a stable condition of an intermediate degree of heterozygosity.

2937 SUENAGA, H., MATSUO, K. & SAKAI, H.
(Varietal differences in the damage caused to broad beans by the broad-bean weevil).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1951 : **1** : p. 82. [Japanese].

A comparative investigation of the damage caused to a series of Japanese varieties is reported. The varieties least injured were Fukuokazairai [Fukuoka Common], Murasakisoramame [Purple broad bean] from Nagasaki, and Kashimazairai [Kashima Common].

2938 ULMAN, U.
(**About growing beans for food grains**).
Sadeh (Field)/Hassadeh 1955 : **35** : p. 686. [Hebrew].

Varieties of *Phaseolus vulgaris* were compared in Israel without irrigation. The best were Great Northern and Granda (Streamliner), yielding 896 and 638 kg. per ha. respectively.

2939 Landbouwstambonen, 1956. (**Field French beans, 1956**).
Landbouwvoorlichting 13 : Bijl. 5 : Ber. Rassenkeuze 1956 : No. 202 : Pp. 3.

Data on yield, quality and degree of resistance to disease and pests are given for the principal varieties of brown, yellow and white field French beans grown in the Netherlands. In trials conducted in 1955, the brown French bean Beka gave the highest yields on clay soils and the white bean Kaboon and the yellow bean Strogele [Straw yellow] the highest yields on sandy soils.

2940 LAMPRECHT, H.
Die Vererbung der Caruncula-Warze bei *Phaseolus vulgaris* und die Koppelungsgruppe *Sur-Y-Cav-Te-Miv-P*. (**The inheritance of the verrucose caruncle structure in *Ph. vulgaris* and the linkage group *Sur-Y-Cav-Te-Miv-P***).
Agri hort. genet., Landskrona 1955 : **13** : 143–53.

A wart-like development of the testa around the caruncle was conditioned by a partially dominant factor *Cav* which, from a number of crosses involving the genes *P*, *J*, *G*, *V*, *Y*, *Fc*, *Ram* and *Sur*, was shown to lie in the linkage group *Sur–Y–Cav–P*. A combination of these with earlier results gave the probable sequence *Sur–Y–Cav–Te–Miv–P*, the exact degree of linkage of *Te* and *Miv* with *Cav* and *P* being as yet undetermined.

2941 **New soybean announced for Central Minnesota and N.E. South Dakota.**
What's New Crops Soils 1955 : **8** : No. 3 : p. 25.

Grant, a high-yielding variety developed by the US Department of Agriculture in cooperation with experiment stations in Minnesota, South Dakota and Wisconsin, contains 20·2% oil and has the same maturation period as Mandarin (Ottawa).

2942 WEBER, C. R.
Chippewa—a new soybean for northern Iowa.
Iowa Fm. Sci. 1956 : **10** : 175–76.

Chippewa is expected to replace Mandarin (Ottawa), Capital and other varieties of similar maturity in northern Iowa, where it has shown superiority to Mandarin in yield and oil content (cf. *PBA*, XXV, Abst. 2512). It matures 5 days earlier than Blackhawk, equalling this variety in yield and oil content.

2943 HOLMBERG, S. A.
Problems of soybean adaptation in Sweden.
Soybean Dig. 1955 : **16** : No. 1 : 18, 20.
Soya-bean adaptation in Sweden.
World Crops 1956 : **8** : 99–103.

Both articles describe the problems and results of breeding soya beans for Swedish conditions, attention being drawn to the value of Japanese material.

2944 MANKAU, G. R. & LINFORD, M. B.
Soybean varieties tested as hosts of the clover cyst nematode.
Plant Dis. Reptr. 1956 : **40** : 39–42.

Of the 27 varieties tested in pot cultures for reaction to an Illinois population of *Heterodera glycines* var. *trifolii*, Dunfield and Earlyana contained small numbers of mature females and eggs with cysts; a few stunted immature females were observed in the roots of six other varieties. No enlarged females or cysts were found in the remaining 19 varieties.

2945 WIKLUND, K.
Nyare ärtsorter i försök inom Norrland. (**Recent pea varieties in trials in Norrland**).
Sverig. Utsädesfören. Tidskr. 1955 : **65** : 468–84.

In trials of 7 fodder peas and 4 yellow peas at various stations in Norrland, Sweden, the early fodder peas Vesta and Nola II gave high yields, the former variety being suitable for cultivation throughout the region and the latter particularly adapted to Västerbotten and Norrbotten; none of the yellow peas appeared suited to the area.

2946 LAMPRECHT, H.
Über die Wirkung der Gene *Con* und *Co* bei *Pisum*, mit einer Übersicht von bisher über die Vererbung der Hülsenform Bekanntem. (**On the effect of the genes *Con* and *Co* in *Pisum*, with a survey of hitherto known facts on the inheritance of pod shape**).
Agri hort. genet., Landskrona 1955 : **13** : 19–36.

Previous literature by the author on the mode of inheritance of pod shape in peas is reviewed with special reference to concave and convex pods. The variety Pois Serpette [Pruning-knife pea] carries the recessive gene *cp* and produces curved pods in which the ventral suture is concave; the curved pods of the variety Pois Sabre [Sabre pea] are due to the convex shape of their ventral suture, a character that is determined by the two recessive and independently inherited genes *con* and *co*. The effect of *con* is more pronounced than that of *co*. Plants with *con co* produce convex pods and plants with *con Co* semiconvex pods whereas plants with *Con Co* or *Con co* have straight pods. The interaction between *Con con* and *Co co* on the one hand and *Nn*, determining pod thickness, *Btbt*, determining blunt or pointed pod tip and *Cpcp* on the other was studied in a wide range of crosses. Plants in which *N* was dominant and *con* and *co* were recessive produced convex pods; if *con* was recessive and *Co* dominant the pods were semiconvex. When *n* was recessive, *con co* or *con Co* resulted in straight pods and *Con Co* or *Con co* in concave pods. The recessive gene *cp* had no visible effect on plants carrying *n*, the pods of which are in any case concave, but caused the pods of plants with *N* and *Con* to be curved. The effect of *cp* was wholly masked in combination with *con co* or *con Co* and the pods were convex or semiconvex respectively. The effect of *bt* was not influenced by *con*, *co* or *cp* to any marked degree. In conclusion the author examines the influence of modifiers, including *te* and *laf* (cf. *PBA*, XXV, Abst. 2532), on pod shape.

2947 LAMPRECHT, H.
Studien zur Genenkarte von Chromosom IV von *Pisum*. (**Studies on the gene map of chromosome IV of *Pisum***).
Agri hort. genet., Landskrona 1955 : **13** : 37–84.

The results of previous observations on linkage and crossing-over values between the genes of chromosome IV (cf. *PBA*, XIX, Abst. 54) are compared with data obtained from a further 31 crosses. Three further genes, *Fo*, *Con* and *Br* (cf. Abst. 2946), have been identified by the author since 1948 and the linkage group of chromosome IV is now given as *N–Z–Fo–Fa–Td–Con–Br–Le–V*. A map showing the relative positions of the genes and the distances between them is presented and data on the frequency of crossing over between the various genes are tabulated. In studying variations in linkage between different crosses it was found that pairs of genes with a high coefficient of linkage variation were more strongly linked than those with a low variation in linkage, crossing-over values ranging from 0 to 25% in the former category and from 25 to 38·5% in the latter. Variations in linkage were greatest when the gene concerned was located at the end of the chromosome.

2948 LAMPRECHT, H.
Ein neuer Strukturtyp von *Pisum*. Ein Fall mit einer einfachen Translokation und einer Duplikation. (**A new structural type in *Pisum*. A case of a simple translocation and a duplication**).
Agri hort. genet., Landskrona 1955 : **13** : 85–94.

The results of seven crosses involving line 680, which contains the gene sequence *a le cp bt N V Con*, are presented. It was shown that *Cp*, which in the normal caryotype is located at the left end of chromosome V, is strongly linked in line 680 with *Bt* on the right end of chromosome VII. There is, however, no indication of linkage between *Gp*, also situated on chromosome V, and *Bt*, so that a simple translocation but no interchange would appear to have occurred. Crosses of line 680 with lines of the normal type gave fertile progeny despite the translocation and duplication of gene *Cp*.

2949 LAMPRECHT, H.
Die Vererbung der Chlorophyllmutante *albina-terminalis* von *Pisum* sowie Allgemeines zum Verhalten von Chlorophyll- und anderen Genen. (**The inheritance of the chlorophyll mutants *albina-terminalis* in *Pisum*, as well as general information on the behaviour of chlorophyll and other genes**).
Agri hort. genet., Landskrona 1955 : **13** : 103–14.

A review of known chlorophyll mutants in the pea and their modes of inheritance is given and the genes for the production of chlorophyll are classified into four groups, viz. *chlorohom*, *chlorodiv*, *chloromut* and *chlorofact*. A new chlorophyll-deficient mutant, designated *albina-terminalis*, is described and attributed to the action of a single recessive gene, *alt*. Up to the third, fourth or occasionally fifth internode the mutants are green but later internodes, of which there are usually 2–4, are white. The mutant fails to grow beyond this stage and does not flower. The experimental line 1018, in which this mutant occurs, was crossed with a number of other experimental lines; no linkage could be demonstrated between *Alt* and any other genes. Linkage between the other genes of line 1018, which has the gene sequence *Le a r i m Pl U D Gp Cp V te*, conformed to previous findings (cf. *PBA*, XXIV, Abst. 2575).

2950 LAMPRECHT, H.
Die Koppelung des Chlorophyllgens Xa_1 von *Pisum*. (**The linkage of the chlorophyll gene Xa_1 in *Pisum***).
Agri hort. genet., Landskrona 1955 : **13** : 115–20.

Chlorophyll-deficient plants of the *xantha* type, a mutation that may be due to any one of several recessive genes, were studied. In the experimental line 344, the occurrence of chlorophyll mutants was shown to be dependent upon a single recessive gene, designated xa_1, which is situated on chromosome VII and linked with *R* with a crossing-over value of 15·3 ± 1·38%. The number of chlorophyll mutants obtained from most crosses was lower than the expected ratio of 3 : 1; the author attributes this deficiency to the greater sensitivity of the mutants to unfavourable environmental conditions.

2951 LAMPRECHT, H.
Studien zur Genenkarte von Chromosom II von *Pisum*. Die Koppelung des Gens *Wa* und die Wirkung der übrigen Wachsgene. (**Studies of the gene map of chromosome II of *Pisum*. The linkage of the gene *Wa* and the effect of the other wax-determining genes**).
Agri hort. genet., Landskrona 1955 : **13** : 154–72.

It is shown that the gene *Wa* governing wax production is identical with Winge's gene *Bl* (cf. *PBA*, VII, Abst. 363) and lies on chromosome II. On the basis of the present results and those of other workers, a gene map is constructed with genes lying in the sequence *Wa–Oh–Ar–S–Wb–*(*La*)*–K–Fu*; the exact position of *La* is uncertain. The interactions of the wax-determining genes are discussed, the author's results (cf. *PBA*, XV, Abst. 415) being compared with those of early work by Wellensiek.

2952 LAMPRECHT, H.
Ein Interchange zwischen den Chromosomen I und VII von *Pisum*. (**An interchange between chromosomes I and VII of *Pisum***).
Agri hort. genet., Landskrona 1955 : **13** : 173–82.

The results of crosses involving line 21 or its derivatives 25 and 924 indicate that the aberrant structure of chromosome VII in these lines is due to an interchange between it and chromosome I (cf. Abst. 2958). The point of interchange in chromosome VII lies between *Tl* and *Bt*.

2953 LAMPRECHT, H.
Zur Kenntnis der Genenkarte von Chromosom VII von *Pisum*. (**Information on the gene map of chromosome VII of *Pisum***).
Agri hort. genet., Landskrona 1955 : **13** : 214–29.

From the combined results of earlier linkage studies and more than thirty recent crosses involving the genes *Wsp*, Xa_1, *Pa*, *R*, *Tl* and *Bt*, a gene map of chromosome VII is constructed, the genes lying in the given order. A new gene, *Vim*, giving a midgreen plant colour, segregated independently of the above factors. The recessive gene *tram* is independent of *r* (cf. *PBA*, XV, Abst. 415) but its expression is influenced by *A*, *M*, U_{st}, *R* and *N*.

2954 MENJKOVA, K. A.
[**The results of crossing the green pea (*P. sativum*) with the field pea (*P. arvense*) and rye (*S. cereale*) with brome (*B. secalinus*)**].
Trud. Inst. Genet. (Trans. Inst. Genet.) 1954 : No. 21 : 179–82. [Russian].

At the Institute of Genetics of the Academy of Sciences *Pisum sativum* ♀ and *P. arvense* ♂ crossed readily and gave fertile progeny and normal segregates. The two forms have the same chromosome number ($2n = 14$) and it is concluded that they pertain to the same species. Crosses between rye ♀ and brome ♂ proved sterile except for two grains suspected to have arisen apogamously. A plant raised from one of the grains survived. It had 14 chromosomes and gave normal rye plants in the following generation. The conclusion that rye and brome are different species is borne out by the sharp competition observed between them under field conditions.

2955 ROD, J.
Vnitroodrůdové křížení u hrachu jako ukazatel šířky dědičného základu. (**Using intravarietal crossing as an indicator of the amplitude of the heritable basis in peas**).
Sborn. čsl. Acad. zeměd. Věd Řada rostlinná Výroba : 1955 : **28** : 915–26.

Comparisons were made between the progenies of pea varieties and lines obtained by (1) selfing and (2) intravarietal crossing. In the varieties, the progenies obtained by intravarietal crossing showed a slight superiority over the self progenies in respect of seed number, dry-matter production and pod number. This effect was not apparent in the lines.

2956 Gelin, O. E. V.
Studies on the X ray mutation Strål pea.
Agri hort. genet., Landskrona 1955 : **13** : 183–93.

Information is provided on the origin of the X-ray mutant Strål [Ray] and its yield in comparative trials with Kloster [Cloister] at Weibullsholm, Sweden, over the period 1946–55 (cf. *PBA*, XXIII, Abst. 2280).

2957 Caroli, G. & Blixt, S.
A cytological investigation for verifying the genanalytical results regarding line No. 680 of *Pisum*.
Agri hort. genet., Landskrona 1955 : **13** : 95–102.

Cytological measurements of the lengths of the seven chromosomes of *P. sativum* substantiated Lamprecht's findings (cf. Abst. 2948) that a translocation had occurred between chromosomes V and VII (here designated chromosomes I and IV respectively) of line 680. The long arm of chromosome VII had become 0·4 μ longer and the short arm of chromosome V correspondingly shorter.

2958 Blixt, S.
Cytological investigation of line No. 21 of *Pisum*.
Agri hort. genet., Landskrona 1955 : **13** : 207–13.

From a comparison of the caryotype of line 21 with the normal caryotype of Kloster [Cloister], it is shown that the interchange found in the former involves chromosomes III and IV, chromosome IV having lost a section from the short arm and chromosome III having increased the length of its long arm. Chromosomes III and IV correspond with the linkage groups I and VII respectively (cf. Abst. 2952).

2959 Unger, K. & Schneider, A.
Über Zusammenhänge zwischen der Reifeentwicklung von Gemüseerbsen und bestimmten mikrometeorologischen Faktoren. (**On connexions between the maturation of garden peas and certain micrometeorological factors**).
Züchter 1956 : **26** : 12–22.

The effect of external environment and of sudden changes in environmental conditions on the development and maturation period of 36 German pea varieties was studied. Temperature was found to be the most important factor involved. Data are provided on the effect of sudden spells of cold weather on the 36 varieties studied and on varietal differences in temperature requirements for optimum growth.

2960 Pesola, A. V.
Protein content of field pea seeds as a varietal character.
Acta agra. fenn. 1955 : **83** : 125–32.

Investigations on Finnish and introduced varieties at the Agricultural Research Centre, Jokioinen have demonstrated that crude-protein content is a varietal characteristic, dependent on polymeric genes. Nearly all the commercial varieties and hybrid lines developed at the above centre had higher contents than the control (Torsdag [Thursday] II), line 0331 (Sinikka x Torsdag II) being the best in this respect, with 2·45% superiority. Of the named varieties bred at Jokioinen, Artturi, Sinikka and Ilo [Delight] had the highest contents, exceeding the control by 1·97, 1·64 and 1·56 respectively.

2961 Riepma Wzn, P. & Veenbaas, A.
Resultaten van het doperwtenrassenonderzoek oogst 1953 en 1954. Rassen met ronde zaden. Landbouwkundige eigenschappen. Kwaliteitseigenschappen. (**Results of the trial of shelling pea varieties, 1953 and 1954 harvest. Varieties with round peas. Agronomic characteristics. Quality**).
Tech. Ber. Peulvrucht. 1955 : No. 67.

Details are given of the disease resistance, stem length and strength, earliness, 1000-seed weight, yield, eating quality and suitability for processing of 25 varieties tested in the Netherlands.

2962 Engelmann, C. & Dobbek, R.
Ein Beitrag zur Sortenresistenz gegenüber Brennfleckenbefall bei Erbsen. (**A contribution to varietal resistance to blight infection in peas**).
Z. landw. Vers.- UntersuchWes. 1955 : **1** : 170–77.

Trials at the Rostock Experimental Station indicated that large-seeded yellow peas such as Goldkugel [Golden Ball] and large-seeded green peas such as Weender Grünbleibender [Weende Evergreen] were more susceptible to attack by *Ascochyta pisi*, *A. pinodella* and *Mycosphaerella pinodes* than small-seeded yellow peas such as Svalöfs Butter [Svalöf Butter] and Nordsaat [Northern Sowing]. Nordsaat was the most resistant of all the varieties tested.

2963 KISS, Á.
A borsózsizsik ellenállásra való nemesítés kérdése. (**The problem of breeding peas for resistance to the pea weevil**).
Növénytermelés 1954 : **3** : 317–22.

At the Martonvásár Agricultural Research Institute, Hungary, intervarietal differences in resistance to *Bruchus pisorum* were found but the progenies of 13 resistant and 11 susceptible plants selected from the fodder pea S 8 Erdoháti showed no differences, indicating that selection was ineffective.

2964 ARGIKAR, G. P.
Two cases of pleiotropy in *Cicer arietinum*.
Indian J. Genet. 1955 : **15** : 50–52.

Cotyledon and foliage colours were found to be controlled by the same gene pair, seeds with yellow cotyledons giving rise to plants with normal green foliage and seeds with green cotyledons to plants with bluish-green foliage which turned bluish-violet upon maturity. Stem and flower colours were also probably determined by a single gene pair, yellowish white stems and white flowers occurring in certain types and pink flowers and purplish green stems in others.

2965 DEODIKAR, G. B. & THAKAR, C. V.
Cyto-taxonomic evidence for the affinity between *Cajanus indicus* Spreng. and certain erect species of *Atylosia* W. & A.
Proc. Indian Acad. Sci. 1956 : Sect. B. : **43** : 37–45.

Morphological, taxonomic and cytological evidence, homology of normal with mutant characters, and the high degree of fertility of intergeneric hybrids indicate a close affinity between *C. indicus* and certain erect species of *Atylosia*, particularly *A. lineata* and *A. sericea*. According to observations on chromosome morphology, *A. sericea* is more closely related to *C. cajanus* than *A. lineata*. Structural changes in the chromosomes may have played a major role in the differentiation of the two genera. *Atylosia* spp. may be useful as a forage legume and also in breeding varieties of *C. cajanus* combining hardiness, perennial habit, tolerance of drought and resistance to pests and diseases. *A. lineata* and *A. sericea* have shown a high degree of resistance to pod borer (*Exetaster atomosa*) and *Fusarium udum*. Taxonomic incorporation of the erect species of *Atylosia* in *Cajanus* is suggested.

2966 LAJOS, D.
Csemegekukorica nemesítési kísérletek. (**Experiments on breeding sweet corn**).
Növénytermelés 1954 : **3** : 165–80.

After a brief survey of methods of breeding sweet corn, the results of fifty single crosses effected at the Institute of Genetics, Budapest, between lines inbred for four or five generations are presented. Ear length was greater in 76% of the hybrids and significantly greater in 28% than in the open-pollinated control.

2967 PRODAN, I.
Contribuţii la cunoaşterea răspîndirii şi sistematicii genului *Thymus* în Republica Populară Romînă. (**Contribution to the knowledge of the distribution and systematics of the genus *Thymus* in the Rumanian People's Republic**).
Bul. Şti. Secţ. Şti. Biol. Agron. Geol. Geogr. 1954 : **6** : 301–08.

A short taxonomic review of Rumanian thymes is presented. Several new varieties and hybrids are described.

2968 IKEDA, N. & UDO, S.
(**Studies on mint breeding. IV. Cytogenetical studies on European mint and its F_1 hybrid with Japanese mint**).
Okayama Daigaku Nogakubu Gakujutsu Hokoku/Sci. Rep. Fac. Agric. Okayama Univ. 1955 : No. 6 : 12–19. [Japanese].

The meiotic configuration of European mint is 24_{II} but chromosome distribution at anaphase II is irregular and fertility is impaired. In Japanese mint ($2n = 96$), meiosis is regular. The F_1 hybrid between the two forms is almost completely sterile ($2n = 72$). In the one F_1 plant in which the anthers did not atrophy, 3–10 bivalents were formed at meiosis, the modal value being 6. (Cf. *PBA*, Vol. XXV, Absts. 2545–6).

2969 MORTON, J. K.
The chromosome numbers of the British *Menthae*.
Watsonia 1956 : **3** : 244–52.

Somatic chromosome numbers were determined in British species and hybrids of *Mentha*. Continental material of several of these mints was also examined. Two polyploid series were distinguished: sect. *Pulegium* with $x = 5$ and $2n = 10$–40, and sect. *Mentha* with $x = 6$ and $2n = 24$–132. The possible parentages of the naturally occurring hybrids and the role of autopolyploidy, allopolyploidy and vegetative reproduction in relation to the diversity in chromosome number are discussed.

BOOK REVIEWS

Foreign language-English dictionaries. Volumes 1 and 2.
Library of Congress, Washington 1955 : $1.75 each : Pp. vi + 246 ; vi + 239.

The present publication is a revised version of a bibliography first issued by the Library of Congress in 1942. The first volume lists the titles of bilingual and polyglot general dictionaries in which English is one of the languages; arrangement is by language. In the second volume, corresponding scientific and technical dictionaries are listed; the arrangement in this case is by subject. Readers of *Plant Breeding Abstracts* would be most interested in the Agriculture and Botany sections, though neither of these is very extensive and the latter contains a number of what are no more than plant lists.

The two volumes provide a useful guide to recent dictionaries and glossaries. The chief drawback is the omission of languages for which no bilingual dictionary including English has been prepared. Thus Basque, many of the Berber and Turki dialects, Tajik and some of the Indochinese languages do not appear. It is likely that even an English speaker would be prepared to approach these languages via an intermediary such as French or even possibly Russian.

FINNEY, D. J.
Experimental design and its statistical basis.
Cambridge University Press 1955 : 30s. : Pp. xi + 169 : tables : plans.

The title is misleading. The book is part of a series called *The Scientists' Library*: *Biology and Medicine* and deals only with experimental design in those fields. According to the editor of the series, "the authors have been asked to emphasize introductory concepts and problems, and the present status of their subjects, and to clarify terminology and methods of approach instead of limiting themselves to detailed accounts of current factual knowledge". This seems a sensible request but Dr. Finney has quite failed to take note of it. In this short book he has attempted to describe the greater part of our knowledge in this field: he includes accounts of complicated designs like lattices without discussing the basic ideas like randomization, significance level or efficiency with nearly enough care. He has tried to put so much in that there is no room for the points specifically mentioned by the editor. The book the editor had in mind would have required considerable care in preparation: it is never easy to explain basic ideas, even to the scientist. The author appears to imagine that by instructing the printer to set up a word in italics he has explained it. The book we have gives the impression of having been hastily written by the simple process of the author reciting what is known about the topic; though in this haste he does not make slips. What is said is correct, but often obscure. A good feature is the wealth of excellent examples taken from research problems.

D. V. L.

GÄRTNER, M.
Grafické vyhodnocovanie pol'nohospodárskych a biologických pokusov.
(**Graphical evaluation of agricultural and biological experiments**).
Slovenská Akadémia Vied 1955 : Pp. 74 : tables.

A considerable amount of restiveness has been shown in recent years by agricultural research workers in respect of the heavy load of computation inflicted on them by their statistical advisors. In the above publication, a translation into Slovak from a German original, the author seeks to alleviate this burden by the use of nomograms. The principal type of experiment considered is the yield trial. The effect of fertilizers and soil heterogeneity are studied in particular. The statistical analysis is based on Mitscherlich's methods, which are widely used in Germany and central Europe, but are the object of considerable criticism by statisticians of the Anglo-American school (cf. *PBA*, XXI, p. 455).

BACQ, Z. M. & ALEXANDER, P.
Radiobiology Symposium 1954. Proceedings of the Symposium held at Liège August-September, 1954.
Butterworths Scientific Publications, London & Academic Press Inc., New York 1955 : 60s. : Pp. xix + 362 : figs. : tables.

The success of informal meetings of a number of specialists from diverse fields all relating to radiobiology has led to the organization of annual symposia on radiobiology, the 1954 symposium being held at Liège in Belgium in August and September of that year. In spite of assurances in the preface that "it was of the utmost importance that publication should be quick in this rapidly growing field", the volume before us bears the date 1955. It contains the texts of most of the contributions to the symposium and of the discussions; those of most interest to readers of *Plant Breeding Abstracts* are the following. In Bacteriophage inactivation under varying conditions of irradiation, T. Alper reports the results of irradiating phage in the presence of various gases and gas mixtures which have led to the conclusion that phage is inactivated by H radicals, in deoxygenated suspensions, and by O_2^- radical ions, in oxygenated suspensions. In the former, protection may arise in acid suspensions from the reaction $H + H^+ \rightleftharpoons H_2^+$. The formation of hydrogen peroxide acts as a protective mechanism for the phage, when irradiations are completed in a short time, but the H_2O_2 may later inactivate the phage by decomposing into the radicals which entered into its formation. It is suggested that the presence of oxygen may enhance radiation effects not exclusively through enhancement of oxidative reactions, but also because the oxygen acts as a means for "storing" radicals which may later become available for reaction with sensitive systems. In After-effects of irradiation of DNA, J. A. V. Butler and P. Simson show that the effect of X rays is to make some of the phosphate more easily hydrolysable by acids. In The action of ionizing radiation on enzymes and viruses, E. Pollard describes experiments which show that different properties of viruses correspond to particles of very different sizes, suggesting that there must be some kind of internal structure in the viruses studied. Somewhat similar conclusions are arrived at by P. Bonet-Maury in L'irradiation des virus [Irradiation of viruses] for the larger viruses but the smaller ones like S13 seem to be completely homogeneous. Inactivation of TPSr, which confers resistance to streptomycin in pneumococcus, was reported by H. Ephrussi-Taylor and R. Latarjet in Inactivation, par les rayons X, d'un agent transformant du pneumocoque [Inactivation by X rays of a pneumococcus transforming agent]. M. Errera, in Action of ionizing radiations on cell constituents considers the effects of irradiating proteins, enzymes, lipids and nucleic acids and concludes that the only clearly apparent immediate effect of ionizing radiation appears to be on DNA metabolism, perhaps through some alterations of the structure of DNA or nucleoprotein itself. A new hypothesis for "chromatid" changes is presented by S. H. Revell on the basis of observations on root-tip cells of *Vicia faba* treated with X rays and various chemicals. An unexpectedly high proportion of the exchanges proved to be homologous and the hypothesis presented assumes that chromatid exchange rather than breakage and reunion is responsible for all aberrations of the chromatid type. The influence of oxygen on chromosome breakage in *Tradescantia* is reviewed by C. P. Swanson in Effect of oxygen tension on the production of chromosome breakage by ionizing radiations: an interpretation, the role of oxygen being envisaged as connected with the indirect transfer of energy. A comparison of different radiations was made by J. S. Kirby-Smith, C. W. Sheppard and D. L. Craig in The relative effectiveness of various ionizing radiations on chromosome breakage in *Tradescantia*, in which 60–kV X rays are shown to be twice as effective in producing chromosome aberrations as 1–MeV γ rays when applied to dry pollen and inflorescences, while fast neutrons were 4–5 times more effective still. The effects of X rays and radiomimetic substances on *Tradescantia* root cells was studied by G. R. Lane, who in Chromosome breakage by diepoxide and by X-rays reports that di (2 : 3-epoxypropyl) ether is as effective as X rays in producing structural chromosome changes in spite of the absence of heterochromatin; the absence of chromosome reunion suggests that breakage occurs near to the time of reduplication and much, though not all, of the evidence accords with Revell's view, referred to above, that the aberrations arise through chromatid exchange. E. E. Deschner in The relationship between chromosome fragmentation and rejoining in *Trillium erectum* following thermal neutron and X-irradiation reports a greater degree of fragmentation and reunion after diplotene irradiation than after irradiation at pachytene or zygotene, for both types of irradiation. Studies on the experimental control of the mutation process by Å. Gustafsson contains reference to differences in the type of mutations produced by treatment with X rays, neutrons, P^{32} and other agencies and by varying the physiological state of the material treated; the desirable erectoid mutants in barley occur most frequently when dry seeds are treated with thermal neutrons and the opinion is expressed that directed mutations are now a practicable possibility. The influence of moisture, temperature and storage on the effects of irradiation is shown by L. Ehrenberg, in The influence of post-radiation factors on effects produced in barley, to be less for fast neutrons than for X rays, the assumption being that the neutrons exert their effect chiefly on nuclear material. In Cytological effect of chronic gamma irradiation and the protective property of certain chemicals against the radiation induced chromosome aberrations, K. Mikaelsen shows the dose rate to be more important than the total dose given; glutathione, cysteine, thiourea, sodium hyposulphite and sodium cyanide were shown to exert a protective effect and reduce the amount of fragmentation, which suggests an indirect effect of radiation on chromosome fragmentation. H. B. Newcombe in Mechanisms of mutation production in microorganisms describes experiments with *Streptomyces* in which a peak was reached in the dose-mutation curve at 8000 r. for X rays and at 400 erg. per min. for ultraviolet rays, the peak in each case corresponding with the whole of the binucleate stage, not to any part of it; fractionation experiments appear to indicate that nuclear division brings no release from an earlier saturation (or impairment) of the capacity for induced mutation. The sensitivity of the individual nuclei proved to be susceptible of control by altering the physiological state of the cell and it is thought possible that the nonlinear dose relationship may be due to physiological causes too.

The volume is well printed and contains an index of contributors but no subject index.

AUERBACH, C.
Genetics in the atomic age.
Oliver & Boyd, Edinburgh & London
1956 : 8s. 6d. : Pp. vii + 106 : 46 figs.

Reasons for believing that the cumulative effects of even small doses of ionizing radiations are likely in the long run to prove detrimental to the well-being of the human race must be known to most geneticists, but people who were never taught even the elements of genetics and those who have forgotten nearly all they ever learnt can have only the haziest notions of the potential risks that may be involved in the application, to peaceful uses or otherwise, of nuclear fission. With the nonscientist in mind, Dr. Auerbach has in this little book set about remedying this undesirable state of ignorance. Her method of doing so is admirable. In order to be able to explain, in her last two chapters (VIII and IX), how X and other rays may affect the genetic constitution of organisms and their progeny she has, in her first seven chapters, to give an outline of the main concepts of general genetics—mutation, genes, chromosomes, meiosis, dominance, sex linkage and the rest. Feeling, however, that all too many introductory works alarm the uninitiated reader by their insistence on Mendelian ratios, checkerboard diagrams and elementary statistics, she has written this book in the simplest, clearest English, without the use of any such supposedly indispensable words and symbols as allelomorph, genotype, phenotype, homozygous, F_1, F_2, Mendel, meiosis or pleiotropy, and has thus succeeded in producing an exceptionally readable introduction to genetics. For the benefit of the reader who wishes to progress to work of a more technical nature, an appendix giving definitions of technical terms is provided; the same reader would probably also have found a short list of recommended books useful, but unfortunately no bibliography is included.

Much of the sugar rendering this little pill so palatable is provided by the charming drawings by Miss I. G. Auerbach: scattered throughout the text, almost with the profuseness of the illustrations in a child's reader, are delightful sketches of big dogs and little dogs, families of spaniel puppies, freckled girls, Siamese cats, Himalayan rabbits, a tailless cat chasing some tailless mice, chickens with frizzly feathers and, rather surprisingly, meiotic chromosomes represented as gay little red and black dancing human figures. It is to be hoped that this very attractive book will draw the many readers it and its subject matter deserve.

WAGNER, R. P. & MITCHELL, H. K.
Genetics and metabolism.
John Wiley & Sons, Inc., New York &
Chapman & Hall, Ltd., London 1955 :
60s. : Pp. xi + 444 : 119 figs. : 54 tables.

The authors are at pains to emphasize that this is a book about genetics *and* metabolism and not the genetics of metabolism, since the evidence for a causal relationship is in most cases still regarded as insufficiently substantial. Early chapters deal with the basic principles of cytogenetics, cell structure and function, and mutation, a fairly clear difference between gene and chromosome mutations being upheld. Chapter 4 comprises a rather approximate and not very accurate exposition of the chemical composition of a number of bodies such as plant pigments, the inheritance of which has been studied fairly accurately; other examples are carbohydrate and vitamin contents of maize grains, and more complex bodies such as proteins and antigens. Consideration is next given to the inheritance of nutritional requirements in microorganisms, with explanations of the techniques used, the action of enzymes and their association with certain cell constituents. Much emphasis is placed on the dynamic properties of assimilation and other cellular processes, many of which involve reversible or cyclic changes. Light on the complex nature of these processes has been shed by studies of labelled atoms and molecules, it having been shown for instance that some of them, such as the incorporation of aminoacids into proteins, can take place *in vitro* without the direct participation of the nucleus. The characteristics of the macromolecule involved in a particular biological reaction may differ in different organisms or even different tissues and an enzyme can undergo considerable molecular alterations without necessarily losing its catalytic specificity; this would indicate that the catalytic activity is dependent on some specific portion of the macromolecule, so that a small change in the molecule may have a very marked effect on its specificity; some of these changes are related to known genetic mutations, though it is emphasized that there is no experimental evidence which establishes that any one enzyme is a direct product of the action of any one gene. Several examples of genetically controlled differences in enzyme activity known in man, fungi and higher plants and animals examined show the relationship between gene and end product to be more complex than has often been supposed. It is further emphasized that the nutritional mutants used for investigating metabolic patterns in *Neurospora* represent not more than one-tenth of the mutants present after inducing mutations. Most of the mutants do not give straight-forward, all-or-nothing reactions and are not selected for study; several mutants showing partial genetic blocks are described before passing on to an account of the evidence that nutritional mutants have provided on the pathways of biosynthesis of the aminoacids, the purine bases of the nucleic acids, the vitamins, the fatty acids and certain other metabolites, though not yet, as it is pointed out, on even the simple carbohydrates, the proteins, the nucleic acids themselves and the more complex lipids. In these descriptions, again, the authors are at pains to point out the many complexities and obscurities that still await an adequate explanation and the various alternative explanations that might be applied to many of the phenomena.

Multiple allelism and the dominance relationships involved are examined and it is suggested that the association of related genes in compact spatial groups may account for pseudoallelism and isoallelism and for the various phenomena of reaction sequences controlled by closely associated enzymes. In fact the gene is now viewed not as a discrete entity on the chromosome but as a block of entities or perhaps as "a region on the chromosome with no definite boundaries, but instead fading away into the next gene".

Various ways in which genes may interact are considered; the would-be distinction between polygenes and oligogenes is regarded as "at best highly artificial", since the extent of observable phenotypic change resulting from mutation of a gene is not a true measure of that gene's significance in producing the total phenotype; moreover, cases are cited that show that the phenotypic expression of a gene varies according to the genetic background against which it operates; examples are given of the production of pigment in plants and animals by complex gene interactions, and even heterosis, it is thought, can be accounted for by interaction between genes.

Various ways in which environmental conditions may affect the phenotypic expression of genes are examined; although one of the most important of the environmental factors is temperature, which may alter the rate of almost any metabolic process, it is nevertheless concluded that no grounds are present for assuming that the processes involved in the modification of phenotype by environment are identical with those produced by gene mutation. Each gene has a reaction norm and if under certain environmental circumstances the reaction norms overlap, similar phenotypes will result. Adaptation to an altered environment, even in microorganisms, is held to be usually accountable for by mutation and selection within a population but a number of cases of enzymatic adaptation which have been shown to be purely phenotypic are passed in review and it is concluded that the phenotype is finally conditioned by complex interrelationships between the gene system, the rest of the cell and the environment; the role of the cytoplasm in this complex system is considered separately, a useful synopsis being presented of present knowledge on cytoplasmic inheritance in *Epilobium*, *Oenothera*, maize and various microorganisms, showing that a characteristic of this type of inheritance is a redistribution of concentrations of a number of metabolites and catalytic activities; much remains to be discovered about the mechanism and the most that the authors can say is that they envisage the process as involving "the segregation, at cell division, of metabolic units having a sufficient influence within the inherent capacities of a given genome to cause the stabilization of a particular pattern of metabolism. These units, so far as we know, have the size limits extending from those of the smallest molecules to the size of the whole cell." The chemical and physiological divergences among tissues within an organism that result from differentiation are taken as a further illustration of the interaction of genes and internal environment in determining the final manifestation and evidence is cited in support of the view that cytoplasmic rather than nuclear differences are responsible for differentiation.

In a rather conglomerate final chapter mention is made of some inherited anomalies in various mammals, including humans, of bacteriophages and transduction and of disease-resistant races of plants and animals. The book is well indexed and there is a bibliography of 726 works referred to in the text.

DOBZHANSKY, T.
Evolution, genetics, and man.
John Wiley & Sons, Inc., New York & Chapman & Hall, Ltd., London 1955 : 44s. : Pp. ix + 398 : figs. : tables.

In order to imbue the reader with an evolutionary sense Professor Dobzhansky begins his book with references to cosmic evolution, starting with the assumed primordial explosion that occurred over five billion years ago, in which the atoms themselves arose; the properties of living matter are analysed and some hypotheses regarding the origin of life are examined. The next few chapters give a straightforward outline of the genic theory of inheritance, many of the examples being drawn from human beings; in discussing the inheritance of acquired characters the author shows how many of the ideas made popular by Lysenko in the USSR were originally propounded by early evolutionists, such as Maupertuis (1698–1759) and Darwin ("provisional hypothesis of pangenesis" 1868), and later shown to be invalid. Much evidence is cited in support of the view that adaptive changes in bacteria, phages, insects and other organisms result from spontaneous mutation. The Darwinian principle of natural selection is explained, together with the modifications the principle has undergone to bring it into line with more recent knowledge of hereditary phenomena; many examples of the operation of selection, both natural and artificial, in populations of known genetical composition are given and the author insists that mutation and hybridization are sufficient to supply the variation and that selection is sufficient to organize it in such a way as to account for evolution. The complex operation of selection in natural populations is explained by examples from human communities, wild populations of *Drosophila* and many plant species in California. Attention is given to the problem of the species, the mechanisms that prevent gene exchange between them and the way these mechanisms may have originated, and without giving a precise definition of the species the author nevertheless succeeds in presenting the reader with a very clear picture of what species are and, perhaps more important, what they are not. The effects on speciation of such events as domestication and polyploidy are explained, an outline is given of Vavilov's centres of origin of cultivated plants and the origins of the domestic horse and cultivated cottons and maize are examined in detail; as regards cotton, while leaving the matter open the author inclines more towards the view that the tetraploids had an ancient origin before the assumed separation of the continents; for maize, the New Mexico finds dating back some 6000 years are regarded as the nearest to the primitive maize that has been found and the idea of *Tripsacum* introgression is regarded as a useful hypothesis.

Homology and other evidence in favour of phylogenetic development and the evolution and advantages of sexual differentiation are explained and there is a graphic description of the populations of the earth in successive ages of geological time as learnt from the fossil record. The descent of man is illustrated by reference to the anthropoid apes and other living representatives of primate groups that the fossil record shows to have been more widespread in the past, to others known only as fossils and to early men such as Java, Peking and Neanderthal. In comparing social traits in human and insect communities Professor Dobzhansky states "the behavior of social insects is innate or instinctive, and is fixed by heredity; human social behavior is learned from others or devised through reasoning and choice". An ant, reading a translation of this book into ant-language, might ascribe to the Professor an element of wishful thinking in this statement and the train of argument to which it leads. The proofs he furnishes of the innate absence of reasoning or logic on the part of the insect might not be specially compelling to an ant studying the ingenious ways which human societies have devised to encompass their own ruin. This is one of many examples of a slight tendency to oversimplification and idealization which may result partly from the necessity for compression and partly from the fact that the book is stated to be aimed at university students and general readers rather than a specialist public. Occasional errors have crept in, such as the reference to Figure 9.2 instead of 9.3 on p. 209 and the statement on p. 258 that in diecious plants the same flower has ovules and pollen grains. However, these defects emerge mainly from the virtues of the book, which are that it covers a very wide field and synthesizes a number of diverse aspects of this field. It may be said to be a book on evolution by a geneticist and a book on genetics by an evolutionist, and as such can profitably be read by experts in both subjects.

KEITH, A.
Darwin revalued.
Watts & Co., London : 1955 : 25s. : Pp. x + 294 : 4 figs.

There are many biographies of Charles Darwin. Sir Arthur Keith claims special competence for adding one more on the score of having for 20 years lived in the shadow of Down House, becoming familiar with Darwin's haunts as well as his writings and, as he modestly expresses it in the preface, "having made a personal study of the branches of knowledge for which Darwin provided a modern foundation". This biography begins with an account of Darwin's home life at Shrewsbury, culled from letters, diaries and Darwin's autobiography, passes to his return from the voyage of the Beagle, with awakening interest in the species problem, coral reefs and atolls, Malthus and—not least in importance—matrimony and the shadow of a mysterious illness. Next come the move to Down House, modest doubts as to the immutability of species, and the "barnacle period", lasting eight years and leading only in 1854 to a systematic attack on the species problem, which started with the building of a pigeon house to enable him to breed his own pigeons; we cannot but wonder at the mental attitude of a man who declares his task to be "to view all the facts I can muster (eheu, eheu, how ignorant I find I am in Natural History) and on geographical distribution, palaeontology, classification, hybridism, domestic animals and plants, etc. etc., to see how far they favour or are opposed to the notion that wild species are mutable or immutable; I mean with my utmost power to give all arguments and facts on both sides". It was fortunate for his family and for the world of science that Darwin possessed a comfortable private income! As in all books about Darwin the most gripping is the part describing how he gradually became convinced of the operation of some evolutionary process, his painstaking observations on the ravages of "slugs etc." on the seeds sown in his garden, his tolerant but firm responses to doubting friends and the letters to sympathetic ones crammed with accumulating evidence in favour of his theory of natural selection; these letters also reveal the slow and painful process by which the evidence from the "Big Book" was compressed into what is referred to as "the Abstract", which however finally turned out to be *The Origin of Species* itself; and, above all, what emerges is Darwin's passionate enthusiasm and respect for facts, illustrated by such requests as that to Wallace for observations on horses' stripes, bees' combs and the nests of birds as evidence of instinct, or his remark "I care more about Drosera than the origin of all the species in the world", and his interest, years later, in how a magenta-stained pigeon fared as a lover, the monkey's use of an eyeglass and the comparison of this with the use made by his baby grandson, to the advantage, be it said, of the monkey! His modesty emerges too, in such remarks as "my brain was never formed for thinking" and his misgivings that an edition of 1250 copies was "too large an edition", the whole of which in point of fact sold on the day of publication. How delightful is his resolve "not to be tempted astray; and *to publish nothing till my volume on Variation* is completed." *Drosera*, orchids, climbing plants, the mud in a partridge's toe, "muddling my brains to a hopeless degree about the divergence of leaves" and cross fertilization all appear among the tempters drawing him away from his great task. His own assessment of his special talents is engaging too: "None, except for business as evinced by keeping accounts, replies to correspondence, and investing money very well".

Biologists will be interested to read Sir Arthur's analysis of those parts of Darwin's theories that have had to be modified or discarded in the light of later results and in his statement concerning our continued ignorance of one of the basic problems of evolution, that of the coordinated change of instinct and structure and function during development. On Darwin's failure to recognize segregation in inheritance he writes "he was so carried away by this decided result that he forgot all about the laws of inheritance": the "decided result" was the phenomenon of hybrid vigour. The baleful effect that this error of Darwin has had on some of his followers we have recently witnessed in the Soviet Union.

Part II of the book concerns itself with the problem of Darwin's illness, his talent for business and keeping accounts, his attitude to religious issues, his own analysis of his motives and psychological development and the importance of association into relatively small groups or societies for the operation of natural selection. Finally there are some interesting observations on Darwin's genealogy and the anthropological type to which he belongs, some personal details of the character of his wife Emma and an account of the later history of their house at Downe. Readers may find it surprising that in the analysis of Darwin's illness a more thorough consideration is not given to an interpretation more in line with modern knowledge of psychiatric disorders.

IRVINE, W.
Apes, angels, and Victorians.
Weidenfeld & Nicolson 1955 : 21s. :
Pp. 399 : plates.

Had it not been for the recent genetics controversy in Russia, where so much drama has emerged and human destinies been direly changed by a controversy between scientific truth and mystic superstition, a book that sets out to retell the early vicissitudes of the Darwinian theory would have little interest to readers in the second half of the twentieth century. As it is, its topical interest is heightened by the ironical circumstance that the sides have changed, the defenders of Darwin having been the progressive searchers after truth a century ago, whilst today the Lysenkoists have promulgated a philosophy of misty obscurantism in the name of Darwinism. The story of the role of Darwin and Huxley in one of the most dramatic episodes of scientific discovery is told in a warm racy style and their lives are traced from biographical records supplemented by much original material including letters, manuscripts and Darwin's autobiography. In the process, a number of the most illustrious and original of the contemporary figures also come to life, as does, through them, the atmosphere of Victorian England with its curious incompatibles such as its worship of "tone", respectability, orthodoxy and common sense, its disposition towards dyspepsia and melancholia, its enthusiastic cult of new and romantic ideas, its rigidity of social form and unbounded opportunities for discovery in new and unexplored scientific fields. The success with which this Victorian atmosphere is conjured up again heightens the tense drama of the events which led to the writing and then the publishing of what the author refers to as the most important book of the century, *The Origin of Species.* The Darwinian principles and their implications are quite clearly expounded; the irony of the obscurity of Mendel's work, which would have provided the key to many of the more debatable aspects, emerges and the long struggle that followed, with its frustrations, humour, unexpected pettinesses and equally unexpected triumphs, takes shape before us in as gripping a form as any detective novel, the stakes being not one human life but the entire mode of thought of a generation of Europeans and, with certain exceptions, of most Americans too. It is again significant of the times that in the declining years of both men the wheel turned full circle and the doctrine of evolution, the spark to which had been supplied by Malthus, became less and less a biological issue and was largely overshadowed by ethical, moral, religious and even political considerations.

The book succeeds in giving a very real picture of the true characters of the two men and their families. It is full of happy turns of phrase, for instance the description of Darwin's moral life, as it emerges from his autobiography, as having "a distinct suggestion of comfort and upholstery"; and of enlivening and enlightening quotations, like the remark of Lord Stanhope to Darwin "Why don't you give up your fiddle-faddle of Geology and Zoology, and turn to the occult sciences?" Or the descriptions of Huxley's success in Tennessee, where, however, "after nearly fifty years of further progress and enlightenment a Mr. Scopes was found guilty in a spectacular court trial of violating a state law which forbade the teaching of evolution in the public schools". There are inevitably a few inaccuracies, such as the references to quadrangles and a Lord Mayor in Cambridge, to the Albert Monument in London and to the "anthropoid origin of man"! It is however a most readable book about an unusually fascinating subject.

MURRAY, D.
Species revalued.
Blackfriars Publications, London 1955 :
13s. 6d. : Pp. xii + 166 : 3 plates.

In the above book, by a Dominican entomologist, the thesis that species are, in general, well-demarcated "natural" groups is maintained, the evidence being largely drawn from insect taxonomy. The infrequency of interspecific intergradation in many groups, the apparent lack of selective significance of many fundamental taxonomic criteria, the standard objection that it is difficult to envisage how certain complex organs or behaviour patterns could have been developed gradually under the influence of natural selection, and similar considerations lead the author to criticize current neo-Darwinian evolutionary theory or to limit its scope to intraspecific variation.

The alternative envisaged by the author is not clearly stated, but he seems to favour the special creation of a large number of species, with subsequent, very limited, intraspecific evolution. While some of the criticisms of neo-Darwinism are undoubtedly cogent, the author is insufficiently equipped scientifically to assail the commonly held position. The frequently perpetrated scientific howlers and the misrepresentation of contemporary theories will undoubtedly lead to the book's receiving less attention than it might otherwise have received. Chapters IV, XI and XII are largely given over to discussing the philosophical and theological implications of evolution; in these the author largely adopts the views of R. D. Clark (cf. *PBA*, XIX, p. 668). The grammar and orthography of the entire book are outstandingly bad.

SINSKAJA, E. N.
(The dynamics of the species).
Ogiz-Seljhozgiz, Moscow-Leningrad 1948 : 12 r. : Pp. 525 : figs. : tables : maps. [Russian].

Professor Sinskaja's book on the species was published in 1948 but since it has only just been received and since it represents the considered views of a distinguished authority on the origin and nature of the lower systematic units of many crop plants we are reviewing it in full for the benefit of the many readers who will wish to acquaint themselves with her views.

In the opening chapter she emphasizes the importance, from the standpoint of evolution, of continuous variation and gives special attention to the investigations of Gregor and his school, Turesson and others. While the importance of these authors and their work is recognized, they are criticized for studying isolated characters rather than the changes in the organism as a whole. The author quotes several examples from her own work, in which detailed studies carried out in the field have shown how one species gradually merges into another on passing from one climatic zone to another or from one altitude to another; species in point are *Medicago glutinosa* and *M. falcata*, *M. hemicycla* and *M. coerulea*, *M. hemicycla* and *M. sativa*, *Onobrychis biebersteinii* and *O. inermis*, *Bromus variegatus* and *B. riparius* and many others in which similar gradations have been observed within the species. No true distinction is seen between geographic and ecological variation and the two together are referred to as "zonal". The ecotype is regarded as the real precursor of the species and is defined; the author insists in the definition that an ecotype may comprise a large number of separate populations, differing possibly in morphological as well as physiological features but having in common their adaptation to a certain set of environmental conditions; Turesson's concept of ecotypes as discrete units is rejected. It is also pointed out that ecotypes are just as clearly recognizable in self-fertilized and apomictic plants as in cross-fertilized. Ecotypes of a number of forage-plant species when grown in a wide range of localities in the Soviet Union have maintained their characteristic features.

The species, like the ecotype, is envisaged as a group of related populations which has arisen by natural selection; different ecotypes of one species cannot coexist in one area and the ecotypes of one species are not a continuation of those of another; if this occurs the species are not true species. These are the main criteria on which the author bases her definition of the species, which she conceives dialectically, as "a stage in the evolutionary process at which a complex of related populations, originating from a common ancestor and possessing a number of common features, develops, in the process of adaptation to the habitats colonized, a system of ecotypes and geoecotypes not mutually superimposed and not constituting on the larger part of the area a continuation of the ecotypes of another specific complex of populations".

Ecotypes may be heterogeneous in respect of characters that are indifferent from the point of view of natural selection; small variations may also occur in respect of characters with a selective advantage but these variations are less than those between ecotypes. This situation is illustrated by reference to variation in a number of climatic groups of various root crops and herbage plants. The opinion is expressed that in reality very few characters are truly indifferent or incapable of assuming a selective value under certain conditions. The polymorphism of an ecotype can be very great in the centre of its area, where it is best adapted to the environment; on progressing towards the limits of its area of adaptation the ecotype becomes more uniform. The ecotypes of the centres of origin of the species are especially polymorphic, for instance *M. hemicycla*, *Dactylis glomerata*, *Phleum pratense* and *Festuca pratensis* in the humid mountain zone of Armenia, on the Lori plateau. The number of characters that vary may be as many as for the species as a whole but the degree of variation in each is less. The areas where this high degree of variability occurs are usually characterized by sharp variations of temperature and other conditions, which encourage change, combined with an environment favourable for the ecotype concerned, which encourages the survival of the changed forms. A number of changed forms may sometimes occur together in mixed populations, at other times they may be found in adjacent areas, differing in altitude or other environmental features. When they are analysed it is seen that these changed types differ not in morphology only but in a series of biological features; they are microecotypes within the ecotype and are referred to as ecoelements, as opposed to isoreagents which differ only in features of no selective value. The ecoelements are incipient ecotypes. The existence of mixed populations of ecoelements is clearly favourable for the survival of the species. Careful comparisons of the ecotypes of *Dactylis glomerata* in the Lori plateau and in the adjacent hills shows the hill types to be more varied and to have higher values for many characters such as internode number and leaf width, from which it is concluded that this is the initial form from which the plateau ecotype is derived. The latter in its turn however possesses certain characters absent in the initial population, such as forms with two internodes, and these are thought to have arisen in response to changed environment. Analogous cases are cited in *Secale kuprijanovii* in Transcaucasia: the ecotype from the plain of Senna differs from that in the adjacent hills in being more uniform, all plants being glaucous whereas in the hills some are glaucous and some green; moreover the ecotype from the plains is more xerophytic than the hill ecotype from which it is supposed to be derived. Timothy populations in the southern parts of European Russian are comprised of upright types, the Central Russian ecotype comprises both upright and semiprocumbent and towards the north the procumbent type becomes progressively more predominant. A study of these populations, and of those of meadow fescue, shows that they probably had their origin in the Caucasus and migrated from there through Kazahstan to the Altaĭ and thence through Western Siberia and the Urals to the nonchernozem zone of European Russia. Figures are quoted showing the existence of clinal variation in this general direction in respect of a number of individual morphological characters as well as biological properties. The Caucasian populations themselves are very mixed, containing both diploid ($2n = 14$) and tetraploid ($2n = 28$) forms of *Festuca pratensis* and also certain forms which combine features characteristic of both *F. pratensis* and *F. orientalis*, and others combining the characteristics of southern and northern ecotypes. In migrating from this centre of origin in the direction indicated above, the species has gradually lost many of its initial characteristics and has also acquired a number of new ones. The same general line of progression is found in *D. glomerata*, *Bromus inermis* and species of *Alopecurus* and *Agrostis*, from early erect, rapid-growing, rust-resistant southern types with light green leaves and high rate of seed production to a northern type characterized by late maturity, procumbent habit, slow growth, dark-green leaves, susceptibility to rust and poor seed production. Although prostrate forms occur in the centre of origin in the Caucasus, they do not possess the other characteristic features, such as late maturity and cold resistance, of the northern ecotype; the same applies to variants in respect of other individual characters. The progressive stages are envisaged therefore not as the rungs of a ladder but as the turns of a spiral, in which there is a great deal of primary, as well as secondary, overlapping.

Ecotypic progressions of a similar character have been observed in European Russia in *Medicago falcata*, *Melilotus albus*, *Vicia cracca*, *Trifolium repens*, *Trifolium hybridum* and *Trifolium pratense*, many of which also migrated from centres in the Caucasus; *V. cracca* probably migrated from Siberia. Even in cultivated species such as *Trifolium pratense* the general scheme of progression from south to north is the same, and the opinion is expressed that these cultivated clovers arose from wild clovers already differentiated into ecoelements, rather than from clovers introduced from Italy and Spain as some authors have supposed. Again the process is envisaged as a change of the hereditary constitution in response to alterations in ecological conditions resulting from migration and artificial transfer to new environments. The gradual change from *Camelina glabrata* in the south to *C. linicola* in the north in the weeds infesting flax crops is another illustration.

Analogous progressions from ecotypes in the foot hills to those in the higher altitudes have been established for *Medicago quasifalcata* and *Onobrychis* spp. in the Caucasus.

Gradual progression from one species to another has been observed also in the Caucasus, where *M. glutinosa* merges into *M. falcata* on passing from east to west, with a number of intermediate populations in which characters of both species are present; the same progression is observed on passing from altitudes of 2200–1600 m. downwards: the pubescence, width and curvature of the fruit become less and in all other characters the populations gradually change from typical *M. glutinosa*, through intermediates which have sometimes been classed as a separate species *M.*

vardanis, to the typical xeromorphic characteristics of *M. falcata.* The progression is again in the form of an overlapping spiral as in the cases of the ecotypes. In Dagestan *M. hemicycla* merges into *M. coerulea* in a similar manner, on passing from the moist slopes to the arid plain. Analogous examples are *Onobrychis biebersteinii*, which in progressing from the high mountains to the lower slopes merges into *O. inermis*, the change in this case being accompanied by an increase rather than a reduction in polymorphism, at least in respect of characters of nonspecific rank; features characteristic of *O. arenaria* also begin to appear.

Figures are even cited from work by Turesson on *Atriplex*, showing that the upright forms characteristic of shifting sand dunes merge in the same way into the prostrate forms on the fixed sands and no grounds are found for regarding the intermediate populations as mere "mixtures", as Turesson does, rather than stages in a progressive spiral. The essential difference resides in the fact that in the cases studied by Sinskaja those semiprostrate forms that occur in the dunes would not be in other features identical with those in intermediate situations, nor would the latter be identical with those few semiprostrate forms that occur on the fixed sands; these, in spite of their similar habit, would have evolved further in physiological characters, ecological adaptation and possibly other respects. The distinction is an important one. Whether it gains in clarity by forcing it into the framework of dialectical materialism and terming it a spiral, is more open to question. To us it would be equally clear to state that not all characters are evolving together or at the same rate. Be that as it may, great importance is attached to these intermediate zones, as they illustrate in space the process whereby in time one species may have been converted into another. Such zones are generally small in relation to the whole area of the respective species, which in the major portion of their respective areas remain perfectly distinct, with no sign of overlapping or intermingling. However, if one of the species enters into an area with specially favourable climatic conditions, a new burst of variation may occur, as has apparently happened with the Mediterranean *Brassica* spp. on reaching the Pacific coast, where a whole series of incipient species are found and have been named *B. chinensis*, *B. pekinensis*, *B. narinosa*, *B. chinoleifera*, *B. nipposinica* etc., the origin of which has been favoured also by cultivation and hybridization. Another overlapping series, referred to as a spiral, can be constructed for species within a genus, e.g. *Camelina microcarpa*, *C. pilosa*, *C. glabrata*, *C. sublinicola* and *C. linicola* and by the same process as was envisaged for the origin of ecotypes and species, so a genus may arise. Many intermediates are known for instance between the genera *Hedysarum* and *Onobrychis*, especially in the older subgenus *Sisyrosema*; this and subgenus *Euonobrychis* are thought to have evolved separately from different groups within *Hedysarum*; certain tendencies, such as the reduction of the wing petals already present in *Hedysarum*, are continued in *Onobrychis*. Similar spirals are found in the relationships between the sections and subsections in genera such as *Onobrychis*, *Medicago* and *Trigonella*.

The constitution of the plant, as defined by the author, comprises phasic development and a number of properties such as tillering, disease, cold and drought resistance and time of maturity, all associated with phasic development, as well as habit and a number of morphological features less closely associated with phasic development. It is differences in the whole constitution that comprise the differences between ecotypes, rather than differences in one or more characters taken individually. Some characters, viz. those marking isoreagents, have no adaptive value and are entirely independent of the constitution; spotting of seeds and such characters would seem to belong in this class. In certain cases, though having no selective value in themselves, these characters may be confined to certain geographical races, or linked with some physiological character and hence indirectly be indicative of constitution. Many ecotypes prove to be mixed in respect of phasic characteristics when moved into unfamiliar surroundings; under favourable conditions these differences behave as isoreagent features, under unfavourable conditions they may assume a selective value and become absorbed into the constitution—and thus establish ecoelements. The same may occur with other characters of less obvious adaptive value such as seed colour; under cultivated conditions features such as pubescence and procumbent habit may suddenly assume a selective value. Since it is the constitution as a whole that evolves, a further principle enunciated is that ecotypes which differ most in biological and physiological features, such as phasic development and growth rhythm, will also display the greatest morphological differences. This principle is illustrated by reference to *Medicago sativa* sensu lato: series *Praesativae* stands closest to the original wild constitution; it comprises the lucernes of the mountains of

Armenia, where no real line of demarcation can be drawn between the wild and cultivated forms and both are highly polymorphous. The series *Praecocissimae* is derived from *Praesativae* and differs from it in having a shorter vernalization stage, quicker recovery of growth, greater earliness and drought resistance, less cold resistance, shallower tillering node, upright growth habit with less branching and a lesser degree of longevity; in all these respects the Yemen ecotype is closer to *Praesativae* than other ecotypes of *Praecocissimae* and in most other characters the Yemen ecotype is identical with the Armenian, from which it is concluded that in evolving from the Armenian to the Yemen ecotype the lucernes have undergone little change in morphological features but a great deal in physiological constitution. Any intermediates between the two groups that may have existed are no longer to be found. The next after the Yemen ecotype is the Arabian, which differs from it in greater leaf pubescence and cold resistance; here the two ecotypes merge into each other. The Arabian ecotype clearly gave rise to the Mediterranean, which includes the lucernes of Chile and Peru, and is less branched, upright and very pubescent, with large fruits and seeds. The next type is the Mesopotamian, still more pubescent, more hygrophilic and paler green in colour, with large dimensions of plant, fruit and seeds; next comes the Tripolitanian ecotype, very similar to the Mesopotamian but more disease resistant and slightly hardier, more upright and differing in the characteristic pubescence of the leaves. Whereas the wild and cultivated forms within the Armenian populations merge into one another in an unbroken series, the different ecotypes of the series *Praecocissimae* that have apparently evolved from them are sharply distinct one from the other, not only in physiological but in morphological characters too, while maintaining a general unity of constitution characteristic of the series *Praecocissimae* as a whole. Analogous situations are found in a great number of plants: the first change is in constitution and morphological changes come about only later; they have never been found to precede the constitutional changes. Thus *Melilotus albus* has evolved in passing from the forest belt of European Russia towards the southern steppes; a lengthening of the growth cycle can be observed before any morphological differences are detectable; and when these occur, they appear first in vegetative characters and only later in the reproductive organs. However extreme the changes may be on arriving at the limits of migration of a given species, they never transcend certain limits characteristic of the constitution of the species as a whole.

In studying the hereditary nature of constitutional differences an analysis was made of the characteristics distinguishing the European radishes (*Raphanus sativus*) from the Japanese (*R. raphanistroides*). In root form they are essentially similar, but the Japanese radishes are larger and entirely lacking in the varied pigments typical of the European group; they differ also in form of leaf and fruit. These differences are ascribed to the action of different sets of environmental conditions which, by a combined process of creating and selecting hereditary changes, in the Darwinian-Lysenko sense, have built up changed constitutions. Western geneticists are scourged roundly for not believing in the creative aspect of the role of selection. The fact that the typical constitution of ecoelements, ecotypes etc. is transmitted to their offspring, even when the possibilities for intercrossing with other types are present, is accepted as evidence of its having been formed by the creative action, rather than the selective action, of natural selection; selective fertilization is one of the factors regarded as responsible for the conservation of the type. Another factor is mass interpollination, which maintains the general constitutional type even in forms of mixed origin such as Tripoli I lucerne, which is clearly a hybrid population containing elements from *M. falcata* and *M. glutinosa*, characters of which segregate out, though only very rarely, on inbreeding. On inbreeding the northern ecotypes of sweet clover certain forms possessing all the features of the northern ecotypes but enhanced in the direction of greater tenderness and hygrophilic properties often segregate out; these correspond to Kirk's lucerne-like sweet clovers which are thus not regarded as mutants but a typical product of the northern constitution. Similarly in oats naked grain is a typical expression of the hygrophilic constitution.

The degree to which the constitution of any given type is dominant is determined, as propounded by Mičurin, by its age. Studies of F_1 hybrids of 13 different ecotypes of *M. sativa* were made and a dominance index was worked out on the basis of all the characters studied. The order of the types when arranged according to these dominance indices was exactly the same as when they were arranged according to their phylogenetic relationships, the highest degree of dominance being found in the wild lucernes of the Armenian mountains, followed by the cultivated lucernes of the same area, the least dominant being those of the series *Euafghanicae* (cf. p. 324 above). The same order is arrived at when considering other constitutional characters such as the length of the light stage in vernalization. Forms resembling the wild Armenian lucernes of *M. sativa* appeared in the F_2 of crosses between *M. falcata* and the Kašgar ecotype of *M. sativa* and with other ecotypes. This is the most robust constitution of all and in crosses with other ecotypes of lower dominance, such as the Yemen ecotype, can absorb some of their constitutional features without loss of vitality, indeed with a gain in some cases when heterosis occurs, whereas the less robust Yemen constitution becomes debilitated and almost inviable if any of the features of the Armenian constitution are incorporated into it. On the other hand in crosses between types of different phylogenetic groups, such as the wild *M. glutinosa* with the Yemen ecotype, the wild type was not dominant and in both F_1 and F_2 intermediate types predominated; they were furthermore the most vigorous.

Evolutionary changes of the constitution are envisaged as occurring by changes in one or two basic features such as reaction to photoperiod, temperature, humidity and the like, a great number of secondary characters being correlated with these basic ones and hence evolving with them. The basic characters are to a certain extent correlated with one another, there being a strong correlation between cold resistance and a long vernalization stage and a lower correlation of drought resistance with a long light stage. The constitution can often be changed artificially by selecting for characters correlated with the basic features, for instance short internodes, which are correlated with earliness in tomatoes and in lucerne with high leaf number, cold resistance, perenniality and a long light stage.

The difference in reaction of ecotypes differing in constitution emerges from the experiments of J. Clausen and colleagues in California, which are criticized however for failure to study the progenies of the plants grown in the different locations. The author in her own experiments has observed that some tropical ecotypes when grown in long days near Leningrad behave exceptionally; for instance the Indian radish (*Raphanus sativus*) formed no swollen roots; the Indian turnip and the Chinese oil radish behaved similarly but produced swollen roots when the day length was cut down artificially; the Indian chard and the wild radish form no swollen roots in either long or short days. The conditions required to cause a plant to depart from the norm may be roughly the same for the entire species but more usually they are different and peculiar to each ecotype, or even for each ecoelement and up to a certain point for every individual, each having a slightly different constitution. Ecotypes from localities with variable climatic conditions, such as hilly zones, are constitutionally more adaptable than those from specialized niches. The adaptive modifications which often parallel hereditary differences between ecotypes are regarded as the early stages in a process which finally leads to the modifications being incorporated hereditarily in the constitution of the ecotype: in certain species no ecotypes have yet been formed and all differences observed are only modifications and nonhereditary. In the course of time those forms which possess the capacity to react in a given way are gradually selected and the final stage of selection is in favour of those in which the reaction is a hereditary feature rather than a mere capacity to react to a stimulus.

Upright habit in lucerne is a sign of early maturity and hence in a certain fashion of senescence and it was found in F_2 populations of hybrids between the prostrate Armenian and the upright Yemen lucernes that the prostrate segregates were more healthy and less prone to degeneration than the erect ones or those which became erect in the second year of growth.

The Darwinian principle of divergence is illustrated by such ancient species as *M. hemicycla*, which combines features characteristic of the younger species *M. sativa* and *M. falcata* and by the greater polymorphism of these two species as compared with the older species: in the course of evolution the number of characters that vary and the degree of their variation tend to increase. Similar illustrations of the divergence principle are found in the smaller units, down to the isoreagents within an ecotype and the author's studies have convinced her that the divergence in constitution is paralleled by divergence in morphological features. Any suggestion of convergence is summarily rejected as being incompatible with the principles of dialectical materialism and of natural selection as the basic factor in evolution. Two identical systematic units cannot arise from different sources, although a strong degree of similarity is possible and indeed frequently occurs: individuals of the northern ecotype of sweet clover penetrate into the steppes of the Ukraine and come to resemble the steppe ecotype in growth rhythm, but their morphological features remain those of the northern ecotype. Greater similarities may arise between members of phylo-genetically distinct series, such as the Asiatic and Mediterranean lucernes, when they come from areas of similar climate, the greatest similarities being again in constitutional features, though they never arrive at perfect identity. Such analogies may be found too between species phylogenetically distant but growing in similar climatic conditions, for instance all the main species of meadow grasses found in the northern part of European Russia; they all have a similar type of constitution, imposed on them by the climatic conditions of the area. There is however no convergence in the specific characters. The Yemen ecotypes of legumes, wheats, crucifers etc. have a great number of common features such as earliness, short stature and small leaves but each species preserves its specific characteristics, these having been formed originally as a result of the whole historical course of development by divergence.

This process of development is examined in part II of the book. The ecoelements within an ecotype, e.g. the early, narrow-leaved form and the later, round-leaved forms comprising the Asia-Minor ecotype of lucerne, when inbred show little or no segregation and maintain the respective types: thus although lucerne is a cross pollinator the two ecoelements do not normally intercross. The ecotypes of timothy and rye-grass from Lori in Armenia proved almost though not entirely homozygous and those of *M. sativa* almost completely homozygous, at least for ecotypical characters, in spite of the absence of any natural barriers causing isolation. In the same way many species within such genera as *Eruca*, *Raphanus*, *Medicago* and *Onobrychis* have become differentiated without loss of interfertility and these are considered to be the genera with the greatest potentialities for further evolution. In predominantly self-pollinated species the process is more restricted. The different forms of isolation, physical and physiological (including genetic) are analysed, much emphasis being placed on the fact that isolation emerges from the process of differentiation itself, without there being any physical or sterility barriers; these latter may in fact be created by the differentiation, not be a cause of it; even where geographical isolation exists, the role of climatic differences is thought to be often more important than mere physical separation in the differentiation of ecotypes and the author favours the use of Gregor's term geoecotype. The development of physical barriers is not a necessity for ecotype differentiation but may nevertheless accelerate it. Attempts to exaggerate the importance of isolation at the expense of that of selection are termed antidarwinian and unscientific. The ideas of Willis, it is maintained, are immediately vitiated by the existence of clinal variation; the principle of random elimination of Reinig is dismissed as overlooking the fact that many characters which appear to be without selective value are directly or indirectly associated with the constitution; the high polymorphism of the populations of mountain areas such as the Caucasus is associated not with their relic character but with the immense possibilities for selection in these areas with their varied climatic conditions. Even Turesson regards selection as a purely negative factor in sifting out unsuitable variants in the formation of ecotypes. In the author's view selection has a positive role in the creation of ecotypes and later of species. The species in the most active stage of evolution are those with the greatest number of ecotypes and the most actively evolving genera are those with the largest number of species. Species that become too narrowly specialized in a particular niche, with few ecotypes, are senescent. The genus *Raphanus*, though an ancient genus, occupies an extensive area with relatively uniform maritime conditions, stretching from the Far Eastern shores of Asia to the Mediterranean and is relatively little differentiated, having only 10, interfertile, species and few ecotypes; it is still capable of further evolution, as in the case of the oriental species of *Brassica* referred to above. *Brassica carinata*, *Lepidium sativum*, *Triticum durum* and many other species in Abyssinia are highly polymorphous but ecotypically little differentiated and hence regarded as primitive. Such a system arises where climatic conditions are highly variable but never extreme or unfavourable for the species in question.

To decide whether hybridization or clinal variation is responsible for the occurrence of forms intermediate between two species, it is often necessary to make a careful study of the distribution of the two respective species as well as the intermediates and related species of the genus; thus forms displaying certain characteristics of *M. hemicycla* occur in populations of *M. sativa* and cannot therefore be taken as evidence that *M. hemicycla* is a hybrid of *M. sativa* with *M. falcata*, as was done by Troitskiĭ. The distribution of the species suggests that *M. hemicycla* is the archaic species from which *M. sativa* in the south and *M. falcata* in the north were gradually derived. When cultivated forms of *M. sativa* meet the wild *M. falcata*, then true hybrid colonies may arise, giving rise to secondary centres of form development; this happens in certain places in the Ukraine, where the *M. sativa* population has absorbed certain features from *M. falcata*, and in parts of Asia, where *M. falcata* has absorbed certain features of *M. sativa*. Similar cases of introgression are cited from the literature for species of *Balsamorhiza*, *Zauschneria* and *Zea*.

Although cross sterility does not necessarily indicate lack of phylogenetic and taxonomic relationship between species, the opinion is expressed that ability to cross is a sign of relationship in the sense of possessing a common ancestor, as in the case of *Raphanus* and *Brassica*; the same applies to the formation of amphidiploids. Thus hybridization in all its forms is regarded as a secondary factor in the process of form development, providing a more complex system of variation for the operation of natural selection. Similarly polyploidy is a secondary factor which may complicate the process of evolution, as in the development of the *M. sativa* complex, with $2n = 32$, from *M. hemicycla* ($2n = 16$), or it may not, as in the development of *M. coerulea* and other species with $2n = 16$. In other cases differences in chromosome number are characteristic of ecotypes, not of species and instances of the polyploids inhabiting more severe and less severe climatic areas are cited. In Armenia there are populations of *Festuca pratensis* containing a number of forms resembling *F. orientalis* but all have $2n = 14$, whereas in Transcaucasia there are populations of *V. orientalis* all having $2n = 28$. Similarly in *Dactylis*: *D. aschersoniania*, which once occupied a large area, now occurs in patches in the forests of the Caucasus, all forms examined being diploid ($2n = 14$) and very uniform in type. In the forest glades of the North Caucasus a large number of ecotypes have been found, many of them deviating towards *D. glomerata* and most, though not all, of them having $2n = 28$. These populations illustrate the way in which *D. glomerata* has evolved from *D. aschersoniana* on passing from the forests to the open fields. The change in type clearly occurred independently of the change in chromosome number, some of the forms resembling *D. aschersoniana* being tetraploid and others diploid. The cultivated forms of *D. glomerata* from Germany, Czechoslovakia and Yugoslavia, which show certain slight resemblances to *D. aschersoniana*, have moreover proved to be diploid, as has the ecotype of *D. aschersoniana* found in the forest glades of the Beštau mountain. On the other hand the cocksfoot of the Armenian mountains, which is a pure *D. glomerata* in type, is also tetraploid. Thus the extreme forms of *D. aschersoniana* are diploid, the extreme forms of *D. glomerata* tetraploid but intermediate forms may be either, with little or no correlation between systematic type and chromosome number. Thus the chromosome change is seen not as a cause of the specific differences but merely a factor serving to accelerate their fixation, owing to the sterility of the hybrids between diploid and tetraploid forms. A certain physiological change seems nevertheless to have accompanied polyploidy, since both in *Festuca* and *Dactylis* the tetraploids tend to occupy more severe and drier habitats. No forms with intermediate chromosome number have been found in nature.

Tabular data are given showing how *M. hemicycla* on the Lori plateau gradually merges into *M. sativa* in the plains to the south according to the spiral system described above: the curvature of the pod, pubescence, pigmentation, xerophytic habit etc. all increase; the Lori population is all diploid ($2n = 16$), round Leninakan the systematic type is intermediate and both diploid and tetraploid forms are found and the true *M. sativa* of the plains of Erivan is all tetraploid ($2n = 32$). Intergradation towards a type resembling *M. falcata* is also observed on passing in a northerly direction from Erivan to Lori, the extreme types being indistinguishable from *M. falcata* except in chromosome number, which is still $2n = 16$; this form is ascribed to a new species *M. quasifalcata*, found mainly in the foot hills of the north-western Caucasus; it is very difficult to cross with tetraploid *M. falcata* and natural hybrids between *M. quasifalcata* and *M. sativa* have proved to be sterile triploids. *M. quasifalcata* is also difficult to cross with other diploid species.

On passing from the typical *M. hemicycla* populations of the moist middle heights of Dagestan, we come to zones of lower humidity where *M. coerulea* subsp. *semicoerulea* occurs, then to maritime steppes and deserts with *M. coerulea* subsp. *caspica*; pubescence, pod curvature and xeromorphism increase but all these populations have $2n = 16$. Other Dagestan populations have revealed a progression with increasing altitude from pure *M. hemicycla* in the moist middle heights to pure *M. glutinosa* on the dry higher slopes; in between, the two species may occur mixed together or form a large number of segregating hybrids. Many of them fill special niches and the clinal progression is thus complicated by this secondary progression formed by natural selection operating on a hybrid population from two species that have overlapped. However, all forms examined, whether intermediate or closely resembling *M. glutinosa*, had $2n = 32$ and were fertile. Artificial hybridization between a diploid lucerne (*M. quasifalcata*, $2n = 16$) and a tetraploid (*M. sativa*, $2n = 32$) produced fertile tetraploid hybrids when pollination was effected with a mixture of pollen from a number of plants, though pollination by the ordinary method gave only sterile triploids. Thus the author does not believe in the possibility of the sudden origin of a species, even by a sudden change in chromosome number. Such changes at most can only facilitate the process of or provide material for the development of a new ecotypic population which eventually develops into a population differing from the initial ones to such an extent as to constitute a new species.

In the third part attention is given to the role of phytocenotic factors in the development of ecotypes and species. Ecotypes differed in their reaction when sown at different densities, many ecotypes of *M. falcata* and *M. quasifalcata*, which naturally grow in dense stands, giving better results in dense sowings, whilst others did better with wide spacing.

Natural selection for capacity to thrive in dense sowings under the shade of flax plants has been as important a factor in the origin of *Camelina linicola* as selection for size of seed; both the flax and the weed are subject to natural selection by climatic factors, and it is the whole complex of these various groups of characters that has been operative, it seems, in the selection of the particular constitution of this and related species; a synopsis of their characteristics according to the author's latest observations is presented. The similarity of the constitutions of the weed species and the species it infests rules out largely any competition between them. Another similar case is *Brassica nigra*, which in Asia Minor has two ecotypes, one growing alone and the other found only in association with *Brassica campestris*, which it has come to resemble in seed size, early maturity, short stature, branching habit and a number of characters that cannot be directly ascribed to selection for seed size; the resemblance is in general constitution and the characteristics are almost diametrically opposite to those of the local climatype growing independently: the weed form is therefore described as a synecotype. A number of other cases of resemblance of weeds to the species they infest and of species commonly growing in association having similar constitutions are cited; others have developed contrasting features, such as shorter stature, which enable them to live in association with a particular species in the same phytocenosis but at different levels; there are even cases where such differentiation occurs between synecotypes within the same species; for instance a dwarf form of *Lepidium sativum* grows in Abyssinia among the tall forms that infest flax. Populations of *M. sativa* or sainfoin may consist of tall, intermediate and dwarf synecotypes, and populations taken from the northern and southern slopes of the same valley in the Caucasus were found to differ in the proportion of the different types, the prostrate types of both species predominating on the northern slopes and the erect types on the southern; similarly in associations of a larger number of species of both legumes and grasses, each species may be found in a number of different synusiae of the same association; the synusiae may be separated in space or in time. The different possible types of phytocenosis and their mode of development are examined. In analysing the problem of competition it is maintained that no competition exists between the individuals of a species or ecotype as long as they are similar in constitution; when individuals of slightly different constitution in the ecological sense are present, under more or less constant conditions, they may display mutual aid or may compete indirectly in that one may be more favoured by certain climatic factors than another. If however there is a change in the environment then the ecoelements that are less well adapted will be eliminated, while the remaining ones change in the direction of the new environment. A new ecotype is formed, a new ecotype is an embryonic species, hence there is competition but still only between and not within species. Similar phenomena may occur when a species passes from one position in the cenosis to another, say from a subordinate to a dominant position or from the forest to the open. After much discussion on these lines, in which a very cautious attitude is taken regarding the possibility of competition between individuals within a species, the author agrees with Lysenko that more research is needed in order to reach a final conclusion on this vexed question.

Centres of origin of plant species form the subject of part IV. The Darwinian principle that each species is monophyletic and has only one centre of origin is accepted and applied also to ecotypes. A great number of species of grasses, legumes and other plants have developed characteristic northern ecotypes, showing that forms at the periphery of distribution are not mere survivors of the original population at the centre of origin but ecotypes that have developed by a continuation of the process of form development in these areas, where in fact it is usually more active than in the areas intermediate between the centre and the periphery. Other illustrations of this principle are the *Brassica* spp. on the shores of China and Japan; the active centres of form development in subsection *Macropterae* of section *Eubrychis* of *Onobrychis* in the western Mediterranean and the Near East, the original centre having been in the central Mediterranean; the relatively new species *Medicago coerulea*; sections *Erosae*, *Samaroideae* and *Pectinatae* of *Trigonella*; subsection *Aristulatae* of *Avena* in the Atlas and Pyrenees and the section *Denticulatae* in Asia; the 14-chromosome species *Veronica tournefortii* which developed in the 18th and 19th century from the Black Sea species *V. filiformis* with $n = 7$, and the two 14-chromosome species *V. agrestis* and *V. opaca*, which developed in northern Europe from the diploid *V. polita* of the Caucasus. When a species reaches the limit of its possible extension of area further extension is often made possible by polyploidy as in the case of *Empetrum hermaphroditum* from *E. nigrum* in the polar region and polyploid forms of *Festuca ovina* in northerly areas. The relatively severe conditions in these peripheral areas may lead to sharp changes in the population owing to (1) elimination of ill-adapted individuals; (2) sudden segregation of aberrant forms in an apparently homogeneous population, which may occur in extremely unfavourable conditions and also in unusually favourable conditions, as in the appearance of plants of tau saghyz without dormancy when the population from the Kara-tau was planted under irrigation; (3) a change of dominance in hybrid populations leading to the appearance of characters hitherto masked; (4) selection of recessive forms through enforced self pollination which often occurs in peripheral areas, though not always, since some younger species, such as *M. coerulea*, are dominant to the parent species *M. hemicycla* in many of their characters; (5) sudden modifications of morphology or composition such as often occur in extreme conditions and (6) chromosomal aberrations other than polyploidy.

That ecotypes are actually evolved in the peripheral areas and do not merely survive from an initial population is shown by the existence in northern Russia of parallel ecotypes of a number of different species having centres of origin in quite different places. The concept of centre of origin is thus relative; it is necessary to distinguish between the old and the newer centres. The newer centres are often in the peripheral zones of the original area, though not always. The centre of origin of a species does not necesssarily coincide with its present centre of diversity, as for instance in *Sesamum indicum*, which arose in South Africa, with all the other species of the genus, but has its centre of diversity in India. Different again are the areas of intense species development, i.e. areas where a large number of new species are found or are being formed, in a great number of different genera; for instance the Caucasus, where ancient species such as *M. hemicycla* and *M. glutinosa*, or the series *Macrocarpae* of *Onobrychis*, are found side by side with younger, derived species such as *M. coerulea* and series *Microcarpae*; a whole series of allied species are found in genera such as *Medicago*, *Onobrychis*, *Triticum*, *Pyrus*, *Prunus*, *Quercus* and others; or "synthetic" types embodying the characters of a number of different species, young and old, such as *M. hemicycla*, with characters of *M. sativa* and *M. falcata*, or *M. coerulea* subsp. *semicoerulea*, with characters of both *M. hemicycla* and *M. coerulea*; there are unbroken series between one species and another formed (*a*) by clinal progression and (*b*) by hybridization between them, crossing taking place more easily at the centres where the divergence between the species has not proceeded so far, for example between *M. hemicycla* and *M. glutinosa* in Dagestan; the centres are characterized by extreme diversity of forms, ecotypes, species etc. and an unusual number of endemics; the ecotypes do not differ from one another however so widely as those from places more distant from the centre; the variation may affect most or all of the characters of the plant in question but the limits of variation are not usually so wide at the centre as they are over the whole area of distribution; the type of habitat in which the plant is found is generally more varied at the centre than in peripheral areas; in general, the plants at the centre are thought to be distinguished by greater vitality than those elsewhere and altogether the centres are characterized not so much by the diversity of forms as by the intensity and variety of the dynamic processes of form development; ideal conditions for this are often found in mountain areas such as the Caucasus.

Examples are given of young species which have suddenly outstripped the whole of the rest of the species of the genus in development and have conquered whole new areas; these include *Eruca sativa* and the oriental *Brassica* spp., *Camelina sativa*, *Medicago falcata*, *Onobrychis arenaria*, *Beta vulgaris* and the tetraploid species of *Tradescantia* and forms of *Biscutella laevigata.* Examples of relics of the original species from which the modern ones are derived are *M. hemicycla*, *Dactylis aschersoniana*, and section *Macropterae* of *Onobrychis.* Species with a limited area may thus be young species that have not yet reached their maximum distribution or ancient species that are stable or declining. The factors that may lead to the extinction of a species after it reaches the maximum of development and distribution are analysed; one of the most important of these factors is when the constitution of the species fails to respond to changes in the environmental conditions of the area in which it has its being, which can happen most readily in highly specialized species. However, when one of these ancient species meets favourable conditions, as *M. hemicycla* in the Caucasus, it may again enter into a phase of active form development and give rise to a complex series of new ecotypes.

DARLINGTON, C. D.
Chromosome botany.
George Allen & Unwin Ltd., London 1956 : 16s. : Pp. xii + 186 : 36 figs. : 17 tables.

The role of the chromosomes in the evolution of many plant groups and their consequent value in settling questions of relationship and classification is the theme of this slender volume, the avowed object of which is to elucidate the subject "by pointing to the problems as much as by providing solutions".

The first chapter gives a simple outline of the standard phenomena of chromosome behaviour in plants, including a more detailed reference to B chromosomes than is usual in elementary texts. In explaining the concept of the species and the principles of botanical taxonomy, the many shortcomings of systematists and the aid they could derive from a knowledge of genetics and cytology and the importance of chromosome changes in evolution are enlarged upon; a number of examples are given of plants in which differences in chromosome number correspond to differences in habitat and various evolutionary tendencies such as that towards a reduction in chromosome numbers, complications through secondary and dibasic polyploidy, changes in chromosome size or shape and the greater variation in herbaceous than in woody plants are discussed. The principle is enunciated that instability is favoured at the periphery of the area of distribution of a species which is expanding, since selection in the marginal area will favour change. Some of the difficulties encountered in applying Vavilov's principle of centres of origin are pointed out and many of the centres are regarded rather as centres of development. A somewhat idealized outline is given of what is known of the origin of many cultivated plants, it being confidently affirmed that teosinte (*Euchlaena mexicana*) is the wild ancestor of *Zea* maize. A number of achievements in plant breeding that have come about through chromosome changes are instanced and an interesting example of the lack of application of plant breeding is cited from timber trees in Britain, where, it is stated, "the results may be seen in the heterogeneous plantations of the British Forestry Commission which expand into our own land and prolong into our own day the methods of primitive man". The far-reaching effects of conscious efforts at plant improvement are illustrated by the ornamental plants, the sweet pea and *Primula sinensis* illustrating developments largely arrived at by genetic change, *Narcissus*, *Iris* and *Chrysanthemum* those resulting from polyploidy and the fascinating history of the garden roses those achieved by a complicated concatenation of intercrosses between different groups with accompanying selection of certain members of a polyploid series.

In an appendix E. B. Ford points out some analogies between the phenomena encountered in the animal and vegetable kingdoms, instancing cases of mutual selection and the combination of genes to produce new effects, and the greater specialization of some species at the edge of their range.

RUHLAND, W. (Editor)
Handbuch der Pflanzenphysiologie./
Encyclopedia of plant physiology.
Springer-Verlag, Berlin 1955 : **1** : DM 160 : Pp. xxi + 850 : 283 illus.

The publication of this large encyclopedia, planned as early as 1937, was prevented by the second world war and it was some time before the original plan, considerably modified owing to developments in the subject, could be proceeded with. The first volume, which has now appeared, is one of two dealing with general principles and is to be followed by eleven volumes devoted to metabolism, together comprising Part II, and five devoted to the physiology of growth, development, reproduction and movement. The contributions, each by a recognized authority in the respective subjects, are some in German and some in English, without summaries in the alternative language; the presentation is of the high standard we have come to associate with the German presses and even the contributions in English are surprisingly free from typographical errors, though the actual English of some, notably those devoted to the nucleus, is decidedly quaint. The first volume contains essays on the genetic control of physiological processes and on the constitution of the plant cell. In explaining the nature of the gene, D. G. Catcheside leans towards a viewpoint halfway between the extremes of the independent particulate gene on the one hand and the chromosome-molecule on the other, finding it probable that there is an organization of the genes into "independent structural units". He gives a brief disquisition on the mode of action of a gene, emphasizing the interactions between a gene and the cytoplasm, other genes and environment and the effect of position on the chromosome; the genetics of biochemical processes in *Neurospora* illustrate the close association between genes and enzyme action but it is concluded that "whether the gene acts as a template for the enzyme molecules, either directly or indirectly through plasmagenes, or whether it functions by controlling in some way the time and rate of enzyme formation is largely unknown". In Interaction of genic and non-genic hereditary units and the physiology of non-genic inheritance, M. M. Rhoades presents some of the evidence which has now led to the almost universal acceptance of the phenomena of plasmatic inheritance. Consideration is first given to plastids, which are shown to be both self-duplicating and mutable, though having apparently a lesser degree of autonomy than the genes themselves; to *Paramecium,* where it is admitted that the extrinsic origin of the killer characters has not been excluded; to mitochondria and their association with enzyme systems in yeasts and *Neurospora* and to cytoplasmic inheritance of CO_2 sensitivity in *Drosophila.* Various forms of nonparticulate cytoplasmic heredity analysed include plasmon differences in species of mosses, *Oenothera*, *Epilobium* and other plants, but the evidence for the constancy of the plasmon in many cases is still found somewhat doubtful owing to uncertainty as to the extent to which contamination of the egg cytoplasm by that of the male occurs. Dauermodification, the barrage phenomenon in *Podospora* and adaptive enzyme formation in yeasts are considered in the same light. In Physiological variability in connection with experimental procedures and reproducibility, F. W. Went considers the degree to which individuals of a species or cells of an individual or organ may vary in properties and the most reliable means of procuring genetically homogeneous material for experiments in plant physiology; a number of possible sources of variation are examined and some interesting material is described in illustration of the extraordinary degree of phenotypic uniformity that can be attained by growing genetically pure seedlings in a controlled environment such as a modern phytotron. We read with interest that this uniformity is now such as to obviate the necessity for statistical treatment of the result! In Variabilität und statistische Behandlung physiologischer Experimente [Variability and statistical treatment of physiological experiments], on the other hand, C. Harte emphasizes the variability of all living material and examines the degree to which this variability can be allowed for by the use of standard statistical methods, which are explained, special attention being given to the particular requirements and limitations of statistical methods applied to biological material.

In the second part, devoted to cell structure, L. Geitler writes on Normale und pathologische Anatomie der Zelle [Normal and pathological anatomy of the cell] and various authors on the role of water in the cell; there follows a series of essays on the cytoplasm, the chemistry of plant cytoplasm being dealt with by S. G. Wildman and M. Cohen, Microscopic and submicroscopic structure, Physical chemistry and Pathology all being treated by W. Seifriz and Einschlüsse [Inclusions] by K. Steffen. The section on the nucleus is treated by J. A. Serra, who writes on the chemistry, the fine structure and the physical chemistry; he takes a very guarded attitude as regards the function of DNA and RNA and the actual identity of the genetic material, leaning towards the view that genes may consist of protein alone during part of their life and become incorporated in nucleoproteins only when they are functioning or multiplying. S. Granick writes on Plastid structure, development and inheritance, giving evidence in support of the view that plastids arise only from preexisting plastids; consideration is given to gene mutations and chromosome changes that affect the plastids, possible cases of cytoplasmic inheritance of plastid characters and others where plastid inheritance has proved to be autonomous and independent of both nucleus and cytoplasm. There follows a series of articles on pigments, chondriosomes and microsomes, vacuoles and the chemistry and microscopic structure of cell walls.

Each essay is provided with a bibliography and the volume terminates with an author index and separate subject indexes arranged in the order of the German and English words, with equivalents in the other language, so that the indexes themselves serve as a kind of lexicon of the subject.

DARLINGTON, C. D. & WYLIE, A. P.
Chromosome atlas of flowering plants.
George Allen & Unwin Ltd., London 1956 : 2nd Ed. : 60s. : Pp. xix + 519 : figs.

Since the first edition of this work, published in 1945 under the title Chromosome Atlas of Cultivated Plants (cf. *PBA*, XVI, p. 248), the number of known chromosome numbers has been nearly doubled and knowledge of cytology, plant geography, ecology and evolutionary relationships has also greatly increased. The present volume, with its scope extended, as the title indicates, to include all flowering plants, will therefore be very welcome to all concerned with any of these branches of botany. Apart from this enlargement and the bringing up to date of the earlier information, it differs in a few respects, all making for greater compactness or ease of reference, from its predecessor. Professor Darlington's long introductory essay has been omitted, having been expanded to form the companion volume *Chromosome Botany* (see. p. 525); the work is divided into a number of sections each covering 1–10 families; and in some of the larger genera, where many species have the same chromosome number, a number of names of species have been omitted, but the references have been retained. This has left room for a more detailed recording of the more variable species. In addition to the improvements in scope and presentation, the present volume is pleasanter to use than the earlier wartime edition, having clearer type and better quality paper.

HARTMANN, M.
Die Sexualität. (**Sexuality**).
Gustav Fischer Verlag, Stuttgart : 1956 : 2nd Ed. : DM 54 : Pp. 463 : 288 figs.

The first edition of this book appeared in 1943 and had as its declared object the review of an extensive literature on sex determination in lower organisms and diploid animals and plants, as a result of which it was shown that the great majority of the data fell into line with the original system of Correns and that the Goldschmidt scheme represented a secondary system applicable to special cases. Between the writing of the first and second editions much new material has been published and has been incorporated, except where it has vitiated earlier conclusions, in which case these have been removed. In its present form the evidence is considered to speak more strongly than ever in favour of the principle of bipolar sexuality applicable to the process of fertilization in all organisms, though every sex cell possesses the potentialities to develop the properties also of the opposite sex and its final development is determined by the interaction of its genetic constitution and a given set of environmental influences. The manifestation of the phenomena is different in haploid and diploid organisms and the former are dealt with first, being illustrated by examples from various algae, protozoa, fungi, mosses and ferns. Various phenomena of bisexuality and relative sexuality are reviewed and it is shown that in organisms where the sexes are distinct sex determination is effected by the segregation of *F* and *M* genes which condition the realizers for female and male characteristics respectively; they are however not alleles but may occupy different sites on the sex chromosome. In monecious organisms *F* and *M* genes are present in equal strength and the differentiation of the ♂ and ♀ tissues is determined by internal and external environmental factors. The same is true in a great number of the diploid organisms, where even in diecious forms the genetic constitution of both sexes has often proved to be identical and the particular stimuli which lead to the manifestation of the ♂ or ♀ characteristics are in many cases still unknown.

Chromosomal sex determination in flowering plants and higher animals is described in its several manifestations, consideration being given also to complications arising from polyploidy and hybridization. Almost without exception the phenomena are brought into line with the assumption of the presence of *F* and *M* genes conditioning the production of sex realizers, the female being in the majority of cases homozygous and the male heterozygous; the realizers serve only to bring to manifestation the male or female potentialities, both of which are inherent in any individual. This bisexual potency is thought to reside in the entire cell or chromosome complex rather than in particular chromosomes or genes. For reasons which seem somewhat lacking in cogency the author deems it necessary to follow Correns in assuming the operation of a further bisexual complex AG, the A complex being responsible for the male organs and the G for the female, this system being however apparently conditioned genically. In a final chapter on fertilization, results of the author and others are cited to show that sexuality and fertilization are not physiological necessities but are controlled by complex interactions of a group of chemical substances referred to as gamones.

The book is well printed and illustrated, though not entirely free from inaccuracies such as references to *isopore Farne* and to *tassed seed* in maize. There are author and subject indexes and a comprehensive bibliography.

MELLORS, R. C. (Editor)
Analytical cytology.
McGraw-Hill Publishing Co., Ltd., London 1955 : £5 12s. 6d. : Pp. xi + 511 : figs. : tables.

Intended as an advanced reference work, this book serves a very useful purpose in bringing together comprehensive information on some of the chief techniques developed during the last two or three decades for the study of cellular structure and function and on their application in biological and medical research. The editor, Dr. R. C. Mellors of the Sloan-Kettering Institute for Cancer Research, New York, has laid emphasis upon physical analytical methods in his choice of contributions, most of which come from American scientists. The first chapter, by A. W. Pollister and L. Ornstein of the Department of Zoology, Columbia University, deals with Cytophotometric analysis in the visible spectrum. A. B. Novikoff of the Waldemar Medical Research Foundation, New York, then describes histochemical and cytochemical staining methods. The next three chapters are also concerned with methods involving the optical spectral region: Phase-contrast, interference-contrast and polarizing microscopy by R. Barer, University Demonstrator in Anatomy, Oxford University; Ultraviolet microscopy and microspectroscopy by J. I. Nurnberger of the Institute of Living, Hartford, Conn.; and Fluorescence Microscopy by O. W. Richards of the American Optical Company. In chapter 6, C. C. Selby of the Sloan-Kettering Institute for Cancer Research deals with the electron microscopy of tissue cells. P. J. Fitzgerald of the Department of Pathology, State University of New York, contributes Radioautography—its use in cytology, and A. Engström of the Karolinska Institutet, Stockholm, chapter 8 on Historadiography. The final chapter, concerned with X-ray diffraction techniques and their application to the study of biomolecular structures, has been written by G. Oster of the Polytechnic Institute of Brooklyn. Each paper is an excellent source of information on underlying principles, instruments, techniques, applications and potential developments. The subject index has been well done and the illustrations and diagrams reach a high standard. Those interested in the application of the various methods to study of the structure and chemical composition of the nucleus and its components will find succinct assessments of the main problems entailed and of progress so far achieved. It is a pity that because of its exorbitant price the book may not be as widely used as it deserves.

KUGLER, H.
Einführung in die Blütenökologie. (**Introduction to floral ecology**).
Gustav Fischer Verlag, Stuttgart 1955 : DM 28 : Pp. 278 : 240 figs. : illus. : 7 tables.

There has been a very considerable revival in recent years, particularly in Germany, in the study of floral biology. Part of this interest derives from the morphological revaluations of floral structure associated in particular with Troll; part derives from the many recent discoveries that have been made on insect behaviour, notably by Frisch.

In *Blütenbiologische Typen als Elemente der Sippengliederung dargestellt anhand der Flora Südafrikas* (*Floral biological types as elements in classification, illustrated from the flora of South Africa*), published by the Gustav Fischer Verlag of Jena in 1954 as one of their series of *Botanische Studien* and reviewed in *PBA*, XXV, p. 446, the emphasis was rather on the morphological aspect. In the present publication, the interest is rather on insect behaviour and the mechanism of pollination.

The book opens with a short historical introduction and a general outline of floral structure and pollination. Autogamy, hydrogamy and anemogamy are then dealt with briskly. Most of the book is devoted to pollination by animals. The pollinating activities of mammals, such as bats, and birds are first described, and then the author settles down to the main task, insect pollination.

Nearly a hundred pages are devoted to insect behaviour. Four motives for insect visits to flowers are recognized, search for nutriment, sexual attraction by flowers mimicking one or more of the attractive characteristics of the female of the pollinating species, search for constructional material, and use of the flower as a site for egg-laying. The optical, olfactory and gustatory means whereby the flower attracts its visitors are treated in detail, as are also the choice of flower by a visiting insect and the modes of pollen transfer. Each of the more important families of pollinating insects is then considered individually.

The last third of the book is a systematic survey of the different types of insect-pollinated flowers. The author rejects the earlier classifications of Delpino, Müller and Kirchner-Knoll, which were largely based on the type of pollinating insect, in favour of a classification based on floral-structural characteristics.

The author succeeds in presenting a vast array of factual information in a coherent and succint fashion. There is comparatively little in the way of theoretical excursus. The book is copiously illustrated with line drawings.

WERTH, E.
Bau und Leben der Blumen. **(The structure and life of flowers).**
Ferdinand Enke Verlag, Stuttgart 1956 : paper covered DM 18; bound DM 20 : Pp. 204 : 46 figs.

The third publication on floral biology to be received from Germany in the last few years (cf. *PBA*, XXV, p. 446 and XXVI, p. 528) is written from a more evolutionary standpoint than the other two.

Prof. Werth, whose first publication on this subject was in 1892, divides his book into two parts. The first is a systematic description, with numerous examples, of the various types of insect-pollinated flowers recognized by the author. The second is more theoretical and considers the evolutionary tendencies affecting the pollination mechanism, the relationship between insect, bird and wind pollination, shown by the pollinating animals and the distribution of the various types of pollination arrangements among the standard taxonomic groupings.

The section of the book expounding the author's views on evolution commences on p. 158. Prof. Werth, as readers of *Plant Breeding Abstracts* will recall, has expressed some highly individual views on this matter (cf. *PBA*, XV, Abst. 1387 and XVI, Abst. 1786). He draws an analogy here between the time series demonstrating reduction and loss of parts in the ungulate mammals and the comparative morphological series showing transition from a primary rotate perianth to specialized and reduced entomophilous flowers and finally to anemophilous types. It is then argued that the morphological series can be interpreted as an evolutionary time sequence, comparable with the ungulate series. It is assumed that, in both cases, the constancy of the direction of evolutionary change can be taken as an instance of orthogenesis and that this cannot be accounted for by natural selection of chance mutants. The hypothesis advanced by the author to account for the morphologically reductive effects is the gradual accumulation with time of a development-inhibiting substance. It is granted, however, that the whole process is under the negative control of natural selection and that the evolution of plants and their pollinators has gone hand-in-hand.

Most students of evolution will find Prof. Werth's views on the matter too speculative for approval but it is refreshing to encounter a little theoretical nonconformity in this field. The book is illustrated by numerous, rather sketchy, diagrams.

HITCHCOCK, C. L., CRONQUIST, A., OWNBEY, M. & THOMPSON, J. W.
Vascular plants of the Pacific Northwest. Part 5: Compositae.
University of Washington Press, Seattle 1955 : $7.50 : Pp. 343 : figs.

The above publication is the first volume to appear of a comprehensive flora of Washington, northern Oregon, northern Idaho, western Montana and southern British Columbia.

Full descriptions and synonymy are given for all the species, each of which is illustrated. The figures, by Dr. Rumely, are beautiful examples of botanical drawing. Keys are provided to the genera and species. The geographical distribution of each species in North America is given, with short indications of the occurrence elsewhere.

It is inevitable that the present flora be compared with Abrams' *Illustrated Flora of the Pacific States*, published by Stanford University Press (cf. *PBA*, XV, p. 111 and XXIII, p. 161). Though not dealing with identical areas, the floras overlap with regard to Washington and northern Oregon. Abrams' flora is better printed, the present volume being reproduced by offset from unjustified typescript. In contrast to the Stanford publication, however, the descriptions of the species in the present work are of greater value, since more information is given on intraspecific variation, on the status of the species, and on their relationships to related taxa. In the Stanford flora, the species appear aloof and detached like Platonic ideas; here, one senses better the complex interrelations of real life.

The introduction to the volume includes a brief but well-expressed exposition of "taxonomic philosophy". Dr. Cronquist, the author of this part, is conservative in his treatment of taxa, but conservative, one might say, for progressive reasons. He shows that not only natural variation, but also taxonomic custom and practical convenience, should determine what taxa are to be recognized. Geneticists are reminded that external morphology is not merely a frill round the chromosomes but a complex of characteristics admitting of a very large range of possibilities. Moreover, when interpretations of affinity based on external morphology are in doubt, so often are the cytological implications of the same material.

The completion of the flora will be eagerly awaited.

SPOONER, E. T. C. & STOCKER, B. A. D. (Editors)
Bacterial anatomy. Sixth symposium of the Society for General Microbiology held at the Royal Institution, London April 1956.
Cambridge University Press 1956 : 30s. : Pp. viii + 360 : figs. : plates : tables.

The fifteen contributions in this volume consist of papers submitted for discussion to the Sixth Symposium of the Society for General Microbiology held in London during April 1956. Together they give a most valuable review of the stages now reached by workers in Europe and North America in the study of the constituents of the bacterial cell and their functions by means of the newer techniques, and clarify the nature of many controversial issues, particularly those concerning the nucleus and its division. This collection of papers should play a significant part in promoting the resolution of outstanding disagreements and the linking up of interpretations based on different techniques and organisms and on the outlooks of different disciplines. K. A. Bisset contributes the opening chapter, Cellular organization in bacteria, discussing the use of controls in cytological methods and some recent research on reproduction, nuclear and cell division, flagella and gonidia, and adding an epilogue on his use of cytological characters in bacterial systematics. Bisset may be said to occupy an intermediate position in the controversy surrounding the nucleus. According to his own observations, the nucleus consists typically of a single chromosome-like rod at right angles to the main axis of the bacterium, dividing lengthwise by simple fission in a reductional manner and without the intervention of the blepharoplast; the nucleus in older vegetative cultures may also take the form of a longitudinal rod, dividing by transverse fission and probably representing a polyploid phase, as in the protozoan meganucleus. The second paper, Bacterial flagella: morphology, constitution and inheritance, comes from B. A. D. Stocker who refers to investigations by himself and other workers revealing that flagellar characters are determined by genes which behave as though arranged in an orderly manner in some genetic organelle and which undergo spontaneous mutation, transduction and recombination. The associated problem of the distribution of the flagella and flagella-determining granules at cell division is also considered. The next two chapters deal with capsules: in Bacterial capsules and their relation to the cell wall, J. Tomesik gives a general survey of research; C. B. Thorne deals with a particular problem in Capsule formation and glutamyl polypeptide synthesis by *Bacillus authracis* and *Bacillus subtilis*. M. R. J. Salton contributes a paper on bacterial cell walls, the study of which has recently made considerable progress as the result of examination of isolated walls by the electron microscope. C. Weibull in Bacterial protoplasts; their formation and characteristics and K. McQuillen in Capabilities of bacterial protoplasts both draw attention to the remarkable capacity of isolated protoplasts to retain, in the presence of a stabilizing agent, many of the activities of intact cells, such as respiration, synthesis of proteins, nucleic acids and adaptive enzymes, growth and even division. A paper by P. Mitchell and J. Moyle deals with Osmotic function and structure in bacteria. The next four contributions are concerned with the nuclear material. Approaching the subject strictly from the standpoint of the morphologist, C. F. Robinow in The chromatin bodies of bacteria maintains his highly critical attitude towards drawing a parallel between the nuclei of bacteria and those of higher organisms, even refraining from applying the term nuclei to the chromatin bodies which he considers are simple structures dividing directly by constriction and lacking most of the properties considered characteristic of nuclei by cytologists. He rounds off the paper with a detailed criticism of the findings of DeLamater and his colleagues who, as is well-known, have obtained evidence convincing them that bacterial nuclei contain chromosomes and undergo mitosis. Readers will be able to draw their own conclusions concerning the validity of this criticism by turning to the next chapter, Bacterial chromosomes and their mechanism of division, in which DeLamater provides a comprehensive account of his investigations. On the organization of the nuclear material in *Salmonella typhimurium* by O. Maaløe and A. Birch-Andersen is an early progress report of the application of electron microscopy, using serial sections and a special composite-picture technique. The tubular structures, about 500 Å in diameter, observed in the "vacuoles" in sectioned cells fixed in OsO_4 and embedded in an epoxy compound, are at present assumed to represent chromosomes. In Chromosomes in micro-organisms, C. G. Elliott comments upon bacterial cytology against the background of problems encountered in investigating the cytology of fungi. He concludes that the alternatives to DeLamater's views are not convincing and lays the required emphasis on the importance of the correlation of cytological evidence with genetical phenomena. In Organisation of bacterial cytoplasm, J. R. G. Bradfield concentrates on investigations by means of the electron microscope. In Inclusions in bacteria, C. L. Hannay discusses the parasporal bodies found in aerobic bacilli at the time of sporulation. The symposium is concluded by a paper on The structure and development of the induced long forms of bacteria by W. H. Hughes; electron-micrographs of thin sections support the view that the injury leading to the development of long forms consists of degeneration of the wall and hydration of the cell contents.

NATHUSIUS, L. VON
Theodor Roemer. Lebensabriss und bibliographischer Überblick. (**Theodor Roemer. An outline of his life and a bibliographical synopsis**).
Universitäts- und Landesbibliothek, Halle (Saale), 1955 : Pp. 131 : 1 plate.

Roemer's name is well known both in Germany and abroad for his research on the genetics and breeding of crop plants, principally cereals and peas, and for the role he played in the modernization of German agriculture after the first world war. A professor at the University of Halle-Wittenberg from 1946 to 1951 he also took part in the reconstruction and reorganization of the research and teaching facilities there in the troubled period following the second world war.

The object of the volume under review is to combine an account of Roemer's life and career with a complete bibliography of his published works. The first section of the book deals with his family life, his relationship to his colleagues and students and his practical achievements in the field of agriculture. Brief excerpts from some of his lectures and writings are also included. The second section provides a classified index of his published works, arranged according to subject matter. The whole is written sympathetically and with great care and serves as a fitting monument to a man who has played such a prominent part in the development of German agriculture during the course of the present century.

AZZI, G.
Agricultural ecology.
Constable & Co., Ltd., London 1956 : 45s. : Pp. xv + 424 : 47 figs. : tables.

Prof. Azzi's views on agricultural ecology have long been a matter of considerable controversy, both in Italy and elsewhere. The present volume, a revised translation of Prof. Azzi's *Ecologia Agraria*, will enable readers unfamiliar with Italian to acquaint themselves with the essence of his views. The author holds the Chair of Agricultural Ecology at the University of Perugia. His work on agricultural ecology dates from 1917. *Ecologia Agraria* was first published in 1928 and a second edition in 1944; a Bulgarian translation was published in 1941 and a Spanish version, under the auspices of the Venezuelan Ministry of Agriculture, in 1947.

In the first part of the book, the author's concept of meteorological equivalents is expounded, by which are meant the upper and lower limits for such factors as temperature and rainfall beyond which yield is seriously diminished. These vary of course during the vegetative cycle and it is therefore necessary to distinguish between the principal phases in the growth of each species. Lysenko's views on phasic development are considered in this respect. Microclimatic conditions and even the effect of lunar radiation are also integrated into the author's scheme.

Part II is concerned with the effect of soil, which is classified on the four-fold basis of nutrient supply, resistance to drought, resistance to waterlogging and ease of working.

Yield, quality and seed production, their interrelations, and the effect on them of ecological factors and such operations as vernalization are treated in Part III. Other topics considered here are the connexion between vegetative period, plant size and cell size and the nature of resistance to unfavourable ecological conditions.

In the last part, the author gives his views on regional trials.

The great merit of Prof. Azzi's treatment is that he only occasionally loses sight of the practical ends in view. Most of the concepts introduced are geared closely to crop yield.

A difficulty in assessing the significance of the views expressed is caused by the apparent lack of contact between Prof. Azzi's school of agricultural ecologists and agronomists elsewhere. Work on this field published in English is seldom cited though one might perhaps have expected some reference to the work of M. Y. Nuttonson at the American Institute of Crop Ecology.

With the exception of an interlude in Chapter XII, standard mathematical statistical methods are not used. Agriculturalists may sympathize here, especially now that suspicion has been aroused that statisticians attach greater importance to the estimation of statistical parameters than to the yield figures that really concern the grower.

Perhaps the most disconcerting features of the book are Prof. Azzi's sudden dives into vortices of obscure speculation, as on pp. 195–7 where the contrast between standard statistical procedures and Prof. Azzi's methods is attributed to the opposition between continuous and discontinuous modes of cogitation, and on pp. 329–32 where an analogy is drawn between growth kinetics and quantum physics.

The translation by Dr. Fano is a creditable performance for someone to whom English is not a native language. The result however is not English; it is surprising that the publishers should not have arranged for its literary editing. Thus, for instance *ambiental* is used throughout for *environmental*, and on p. 304, crop varieties characteristic of favourable growing conditions are assigned to *the levelled and enthropic* [entropic] *neutral zone.* Little emphasis is laid on the correct spelling of foreign words.

Ziekten en plagen van *Hevea brasiliensis* in Indonesie. (**Diseases and pests of *H. brasiliensis* in Indonesia**).
Centrale Vereniging tot Beheer van Proefstations voor de Overjarige Cultures in Indonesië, Djakarta 1955 : f. 50 : Pp. 114 : 30 figs. : 18 plates.

This book is intended to supplement and bring up to date Dr. A. Steinmann's work entitled *De Ziekten en Plagen van Hevea brasiliensis in Ned. Indië* [*Diseases and pests of* H. brasiliensis *in the Netherlands Indies*], which was first published in 1925. Part I deals with damage caused to the roots of rubber trees by fungi, bacteria and termites, part II with diseases and physiological disorders of the tapping panel and part III with diseases, insect and other pests and parasitic plants that afflict the stem and branches. Parts IV and V are devoted to affections of the foliage of the mature tree and to seedling diseases, respectively. All the diseases and pests are described in detail, the effects of each being illustrated by attractive colour plates. Valuable information on control methods is also given and a bibliography provides sources of reference to other works on the subject.

This book, which is written in an interesting style and is obviously the result of careful and intensive research, should prove of the utmost value to the rubber grower and is recommended without reservation as a handbook for ready reference.

ZIELINSKI, Q. B.
Modern systematic pomology.
Wm. C. Brown Co., Dubuque, Iowa 1955 : Pp. x + 296 : 70 figs. : tables.

This large, well-produced loose-leaf volume differs from other text books of systematic pomology in its wide scope and its constant attention to the importance of breeding. The book is divided into two parts. The first, consisting of twelve chapters, outlines the main botanical concepts necessary to a grasp of the subject and includes detailed chapters, useful to the elementary student, on descriptive terminology relating to flowers, fruits and other plant parts. Chapters on the geographical origins of cultivated plants and the use of wild species in breeding and on the improvement of varieties are also included. A list of references is provided at the end of each chapter. Unusual features are a chapter devoted entirely to a survey of the most important literature and another entitled Chronological outline of important developments in systematic pomology, the first entry being "2440 BC. Directions for wine making are recorded under the Fourth Egyptian Dynasty." The chapters of the second part are each concerned with descriptions and discussions of individual fruit and nut species or groups of species, the taxonomic relationships within each group being noted, the range of variation in each species and the scope for improvement indicated. This fairly detailed treatment is reserved for species commonly grown in North America, the subtropical, tropical and other less widely grown fruits being dealt with in a single chapter listing their common names, botanical names and family, distribution and most important varieties.

Designed chiefly for college students in North America, this book should, however, with its clarity of presentation, prove useful to horticultural students elsewhere.

LINDQUIST, B.
Forstgenetik in der schwedischen Waldbaupraxis. (**Forest-tree genetics in Swedish sylvicultural practice**).
Neumann Verlag, Radebeul & Berlin 1954 : 2nd Ed. : DM 9.50 : Pp. 156 : 67 figs. : tables.

Professor Lindquist's treatise on forest-tree breeding, *Den skogliga rasforskningen och praktiken* [*The study of forest-tree races and forestry* *practice*], was published in Sweden in 1946 and reviewed in *PBA*, XIX, p. 193. A translation into English was published in the USA two years later and referred to in *PBA*, XIX, p. 930. The second edition of the German translation has now been received and should considerably extend the range of usefulness of what is generally regarded as an excellent introduction to forest-tree breeding, in particular the selection of élite material. Though Professor Lindquist writes primarily of Swedish forestry, much of what he has to say applies also to central Europe.

Professor Rohmeder, whose papers on forest-tree breeding have frequently been mentioned in *Plant Breeding Abstracts*, contributes a postscript relating what has gone before to the German forest-tree breeding work. The translation was made by J. Räder-Roitzsch and I. Pein.

HUBER, B.
Vergleichend-anatomische Untersuchungen aus dem Forstbotanischen Institut München. (**Comparative anatomical investigations from the Institute of Forest Botany, Munich**).
Gustav Fischer Verlag, Jena 1955 : Bot. Stud. No. 4 : DM 15.50 : Pp. vii + 164 : figs. : plates : tables.

Previous members of this series have been botanical monographs and have been reviewed *passim* in *Plant Breeding Abstracts*. The present volume is a symposium on the anatomy of woody plants by contributors from the above institute. There are four papers in all; the subject matter of each is unconnected with that of the others. B. Lederer presents a comparative histological study of the transfusion tissue in selected living gymnosperms. A. Wutz describes the origin, development and seasonal changes in lenticels in various angiosperm and gymnosperm trees. H. J. Braun deals with the ontogeny of the medullary rays in the pine, oak and beech and more cursorily in *Lonicera tatarica* and the poplar. The final paper by W. Holheide is a study of anomalous secondary thickening in the hornbeam.

Proposal for International Rules of Genic Nomenclature and Symbolization. Genetics Society of Canada.
Undated : Pp. 34. (Mimeographed).

A copy of the proposals being circulated by the recently formed Committee on International Rules of Genic Nomenclature and Symbolization of the above Society has been received. As explained in the accompanying circular letter, the proposals were originally drawn up by the Committee on Nomenclature set up in 1954 by wheat geneticists of the Associate Committee on Plant Breeding of the National Research Council of Canada. It is hoped that these proposals, which in their present form are only intended as a working basis, will attract the interest of geneticists in other countries and that comments and alternative suggestions will be submitted. It is expected that the recommendations in their final state will be presented to the International Congress of Genetics to be held in 1958 in Montreal. This draft is divided into five chapters dealing respectively with (1) Basic considerations and guiding principles, (2) Definitions of genetical terms, (3) Conditions of publication and acceptance of genic names and symbols, (4) Nomenclature of genic phenomena and (5) Provisions for acceptance and modifications of the rules. If not already received, copies of the recommendations may be obtained from Dr. Áskell Löve, Institut Botanique de l' Université de Montréal, 4101 est, rue Sherbrooke, Montréal 36, P.Q., Canada.

NEW JOURNALS

Forest Science

Forest Science is published quarterly by the Society of American Foresters, with the co-operation of forestry-research and educational organizations. The first numbers have included papers on the breeding and genetics of forest species. Further information may be obtained from the Society of American Foresters, Mills Building, Washington 6, DC. Subscription $6.00. per year.

Maydica

The results of experiments carried out at the Stazione sperimentale de Maiscoltura [Maize Experimental Station] at Bergamo in northern Italy have hitherto been published in the bulletins and annual reports of the Station. Henceforth they will appear in a special journal, *Maydica*, which will be published at three-monthly intervals; the first number, which appeared in January 1956, contains articles on the use of male sterility in producing hybrid seed, on *Helminthosporium* disease and the Italian hybrid Insubria 521, notes on maize hybrids suitable for growing in Italy and various items culled from the international press. The relevant articles have been referred to in this number of *Plant Breeding Abstracts*.

Maydica is published by the Stazione sperimentale di Maiscoltura, Casella postale 164, Bergamo, Italy; annual subscription L.it. 2000, single numbers L.it. 600.

Sementi elette

Sementi elette [*Selected Seeds*], the first number of which appeared in September of 1955, is the official organ of the Ente Nazionale Sementi Elette [National Union for Selected Seeds] in Italy. It contains notes on current topics concerning the production of new crop-plant varieties, seed production and control and related activities in Italy, together with current items of news culled from the agricultural and technical press in Italy and elsewhere. Those articles dealing with plant breeding have been referred to in this number of *Plant Breeding Abstracts*. *Sementi elette* appears six times a year, being published by Edagricola, Casa Postale 583, Bologna, Italy, the annual subscription being L.it. 2000, single copies L.it. 400.

Zeitschrift für landwirtschaftliches Versuchs- und Untersuchungswesen.

This new journal, which is published by the German Academy of Agricultural Sciences, Berlin, is intended to maintain contact between the theoretical and practical aspects of agricultural research and will deal mainly with questions concerning seed testing, soil conservation and fertilizers and the development of experimental techniques. The first number contains articles on the work of the German Academy of Agricultural Sciences, the development of field experimentation, problems of seed testing, the results of soil research in eastern Germany, research on new phosphate fertilizers and the statistical evaluation of experimental results (cf. Absts. 1940 and 1941). Correspondence should be addressed to the Akademie-Verlag GmbH, Berlin W8, Mohrenstr. 39.

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